Ontario

Economic and Market Assessment

Ontario Waste Management Industry

November 1998

ONTARIO'S GREEN INDUSTRY

Economic and Market Assessment of the Ontario Waste Management Industry

A Sector Study for the Green Industry Office of the Ontario Ministry of the Environment

November 1998

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ONTARIO'S ENVIRONMENT INDUSTRY SECTOR

Ontario currently has more than 2,000 companies that constitute its environment industry, with leading-edge technologies to provide solutions to problems involving the use of air, land, water and energy.

Companies in Ontario's environment industry offer products, processes and services which prevent pollution, protect or clean up the environment. Companies in this sector offer expertise in the areas of:

- Water and wastewater treatment/water conservation
- Solid and hazardous waste/recycling
- Site remediation and reclamation
- Energy conservation/renewables
- Air pollution control
- Monitoring/instrumentation/labs

The Ministry of the Environment supports the environment industry sector through its Green Industry Office (GIO), whose goal is to stimulate the growth of Ontario's environment industry in domestic markets and around the world. The GIO assists the sector in three main areas: business development, market information and intelligence and trade promotion. The GIO also provides comprehensive information on the sector. As part of its ongoing initiative to provide information on market trends in the environment industry sector, the GIO commissioned TCI Convergence Limited, a Toronto management consulting firm, to conduct an enonomic and market assessment of Ontario's waste management subsector in January, 1998. The study identified how a number of key market trends will impact Ontario's waste management subsector, options/strategies for Ontario's waste management companies to successfully compete in domestic and international markets, and strategies for handling a shift in the composition of this environment industry subsector (i.e., consolidation, mergers).

We welcome your feedback on the report, and invite you to complete and return the **Reader Response Form** which you will find on the last page of this document.

ACKNOWLEDGEMENT

This project was directed by an advisory committee comprised of the following members:

- Adam Ciulini, Ministry of the Environment, Waste Management Policy Branch
- Colin Darcel, Maratek Environmental Inc.
- Nora Gurland, Ministry of the Environment, Green Industry Office
- Jacquie Maund, Ministry of the Environment, Green Industry Office
- Deborah McKeown, Ministry of the Environment, Green Industry Office
- Mary Ouroumis, Ministry of Energy, Science and Technology
- Jane Pagel, Philip Services Corp.
- Derek Yue, Industry Canada

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DISCLAIMER

The views and ideas expressed in this report do not necessarily reflect the position or policies of the Government of Ontario (Ministry of the Environment), nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

The Ministry of the Environment does not assure or guarantee the accuracy or completeness of the information contained in this report.

Economic and Market Assessment
# of the Ontario Waste Management Industry

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1.0 EXECUTIVE SUMMARY

This report is primarily concerned with Ontario's industrial and hazardous waste management industry. At the request of the Steering Committee for the study, residential and commercial waste, waste remediation and water treatment activities were excluded. The report is intended to provide a general overview of the size and structure of the industry in Ontario, an overview of opportunities for Ontario-based firms in both domestic and export markets and identify some of the problems and constraints that the industry is facing. The report concludes with industry views on the roles which key stakeholders can play to assist the sector in realizing these market opportunities. The report cannot aim to address all of the questions that individual companies will need to ask about current and future opportunities. Each company will thus need to consider this report in light of their own unique position in the business.

***Industry Definition*:**

For the purposes of this report, the industrial and hazardous waste management industry is defined as companies that provide the following products and services:

Products	· Hazardous waste storage/treatment equipment · Waste collection equipment · Waste disposal equipment · Waste separation equipment · Recycling equipment · Incineration equipment · Composting systems
Services	· Emergency response and spills cleanup · Waste handling - collection, transport, transfer stations and disposal · Operation of sites · Ownership/management of sites · Recycling (sorting, baling, cleaning) · Operation of recycling plants (materials recovery facilities) · Hazardous waste management · Medical waste management · Nuclear waste management.

1.1 The Industrial and Hazardous Waste Management Industry in Ontario

The waste management industry is a major contributor to the Ontario economy. According to the most recent Statistics Canada information, in 1995 the Ontario waste management industry had revenues of $1.28 billion. A recent survey by OCETA (the Ontario Center for Environmental Technology Advancement) indicated that 49% of sales of products and services of the industry were to Ontario with 18% to the rest of Canada and 35% exported.

The industry is very diverse in nature and includes many different types of companies. It includes small manufacturers of proprietary technology, large companies who collect, transport, recycle and dispose of waste, engineering companies who specialize in environmental assessments and many others.

1.2 Changes Occurring in Ontario's Waste Management Industry

Major changes are occurring that affect industrial and hazardous waste companies in Ontario. These include the following:

- The emphasis of the industry is gradually moving from that of treating and disposing of waste to pollution prevention and waste minimization.

- There is industry consolidation, particularly among large companies. The result is an industry composed of a small number of very large companies, many of them multi-nationals and U.S.-based, working alongside a host of medium and smaller companies, most of which are Ontario owned. Many of these smaller companies face not only the normal problems of financing that many small companies face, but some also believe there is a perceived 'stigma' among potential sources of finance toward an industry that is only heard about publicly when there is bad news.

- Changes in waste generation sources are affecting some of the traditional economics of waste collection and treatment. Decentralization of health service delivery is one example. As the health care delivery system is restructured, with many traditional services delivered by facilities other than hospitals, such as homes for the elderly, clinics and in-home service, the sources of waste can become more dispersed, making cost-efficient waste management more problematic.

  Other trends identified by respondents are the outsourcing of collection and treatment of waste as a 'non-core' business by clients and the continued growth of newer sectors such as electronics where reclamation of materials can be an attractive opportunity. There is an increasing attitude that exporting waste out of province should be avoided and that problems need to be dealt with locally.

- An international marketplace that provides an array of opportunities from treatment of highly toxic and radioactive waste in the United States to basic collection and treatment of waste in many areas of Latin America, Africa and Asia. Developing an understanding of local market conditions is critical for success internationally. It will often involve working with local partners in each country.

  Not all companies are suited to an aggressive pursuit of export markets. It can be time consuming, expensive and take a long time to make a return on the investment involved, but for companies who are well-prepared there can be excellent revenue opportunities.

- The emergence in some large industrial sectors of targets for 100% closed loop recycling systems such as in large metal finishers or "cradle to grave" producer responsibility, for example in the automotive industry in the European Union. There is a movement to products being designed and manufactured specifically with their disassembly and re-use in mind, particularly in the electronic and automotive industries.

Impact of Change

Suppliers of waste management products and services are now having to answer the question ‘how can I save money or help to make money for my customer’ rather than just disposing of waste. This means that companies are having to better understand what is happening in the customer’s manufacturing process and to position themselves as adding value through innovative methods of waste prevention or re-use rather than being simply perceived as a waste management cost.

This trend means an upgrading and expansion of the expertise necessary to develop opportunities with clients. Suppliers of waste management products and services will need to develop closer relationships with their clients in order to understand their client’s business in more detail and to identify opportunities for creative solutions.

One way of dealing with this need for creative solutions is by means of developing more alliances, partnerships and other associations to develop new products, to innovate and to provide the necessary scale and competence. These relationships may be with suppliers of complementary waste management products and services, or even with suppliers of raw materials or energy, in order to provide waste generators solutions for complete, efficient use of input resources.

1.3 Stakeholders and Government

There are many stakeholders involved in the management of industrial and hazardous waste. The federal government, provincial government and municipalities themselves all have a role in the formulation of policy and regulations that are applied to waste generators and suppliers of waste management products and services. In addition to government there are associations that represent the supplier community, associations that represent generators of waste as well as the myriad of differing individual companies that generate or manage waste. Other stakeholders could include community groups, non-governmental organizations (NGO's) and workers in the industry. This is a wide array of players and different interests, some of which can be in conflict.

The Ontario Ministry of the Environment

The Ontario Ministry of the Environment (MOE) is the major government player in the industrial and hazardous waste management industry. The roles of the Ministry are many. Ministry roles include protecting the environment, conserving resources, establishing a regulatory framework, setting standards, setting policy direction, monitoring activity and enforcing regulations. A continuing important role for the Ministry is to facilitate the development of the industrial and hazardous waste management industry and to promote waste diversion. This is done within the regulatory framework, recognizing that stakeholder input is important in understanding the impacts of any new regulations and reviewing any existing regulations, or other factors affecting the growth of the waste management industry.

Environmental issues continue to be important to Canadians. Media interest, however, naturally tends to focus on stories that negatively affect the industrial and hazardous waste management industry rather than on the many positive aspects that Ontario's waste management industry can claim. Reinforcing the positive message of Ontario's industry might become an even more important role for the Ministry in the future.

2. 0 APPROACH AND METHODOLOGY

Methodology

The purpose of this study was to conduct an economic and market assessment of Ontario's waste management sub-sector. More specifically, the study was to profile the composition of Ontario's waste management industry, to examine its structural strengths and weaknesses and to assess opportunities and threats. The methodology was designed to not only generate the necessary information needed to respond to the Request for Proposal, but also to try and involve Ontario companies in a commitment to publicizing the results and supporting any necessary actions that are initiated in response to the research.

The main parts of the methodology were:

- a review of the available information, from previous studies that have been conducted to establish what is known, what is not known, where gaps in information are and developing a plan to fill the gaps by means of field research. A list of references is appended to this report.
- a series of meetings with the Committee that were selected to guide this study.
- a field research program that included focus groups conducted in Toronto representing:
    - suppliers of products and services
    - waste generators of biomedical, electronic, automotive, plastic and metallurgical waste
    - a program of 20 in-depth face to face interviews with suppliers of waste management services
    - a program of up to 50 telephone interviews with suppliers of waste management services to supplement the face to face interviews and broaden the coverage

At the initial meeting we discussed the background to the study and discussed our approach to the work and agreed on a schedule. We identified the names of some individuals to be contacted, within associations and companies and we also discussed available published reports to be reviewed.

We conducted two progress meetings prior to tabling our draft report. These meetings with the Steering Committee enabled the TCI Convergence team to exchange ideas with the Committee and to use these meetings as part of the research process as well as part of the formal reporting process.

We conducted two focus groups with individuals who represent the industry's waste generators and, in a separate group, companies representing suppliers of products and services. The objective of the focus groups was to discuss in an unstructured way the state of the waste management sector in Ontario, the threats and opportunities that it faces and to discuss some of the key strategies that need to be developed in order for the industry to be able to take advantage of the opportunities that are emerging.

Questions addressed by the groups included;

- trends that the industry is facing
- new and emerging areas of opportunity
- opportunities in export markets
- strengths, weaknesses, opportunities, threats (SWOT)
- recent changes in ownership and implications for the sector
- key business challenges for the sector and for specific sub-sectors (linkages, partnerships, joint ventures, licensing)
- human resource challenges
- relationships with and to government, and
- needs of the industry.

Approximately ten persons to each group were invited and the list of attendees is appended to this report.

Those attending focus groups represented generators of four specific types of waste, biomedical, metal finishing, automotive and plastics and electronic. We selected these as representatives of companies who have either difficult streams to treat or are potential new areas of opportunity. Our team's previous experience in conducting work for OCETA was used to identify these streams, which were also supported by other bibliographical sources. Suppliers were selected to represent both large and small companies in Ontario's waste management business.

For the remainder of the fieldwork we conducted a survey of 70 individuals representing a range of companies in the waste management sector and its sub-sectors. Twenty of these interviews were conducted in person and the remainder by telephone. A list of respondents is presented in the appendices. In total we thus contacted around 90 people by means of focus groups, personal interviews and the telephone survey, in addition to the input we received from Steering Committee members.

3.0 CURRENT STATE OF THE ONTARIO WASTE MANAGEMENT INDUSTRY

The industrial and hazardous waste management industry in Ontario is in a state of transition. The following section:

- Outlines the major industry trends and issues as outlined by the study respondents and a review of literature.
- Summarizes the strengths and weaknesses of the industry.
- Reviews the economic state of the industry now and in future, as forecasted by the study participants, Statscan and other authoritative studies of the industry.
- Highlights progress on major pollution prevention initiatives.

The implications of the major industry trends and issues are described in Section 6, "Strategic Implications".

3.1 Major Industry Trends

1. Industry demand for services is shifting to being driven more by the need for cost-effective solutions and the potential for cost reductions or increased profit and less by regulatory compliance.

    - Regulations historically have largely established the characteristics of the industry including the structure and types of products and services. Private companies in Ontario cannot depend only on government regulations and legislation as the basis of a successful business, but must also demonstrate the economic benefit of waste management. Waste management product and service companies must provide economic value to customers.

    - There is an increasing trend whereby new toxins reduction, pollution prevention and recycling efforts are being implemented by industry on a voluntary basis, usually in cooperation with government initiatives.

    The 1998 U.S. Industry and Trade Outlook report, published by McGraw-Hill/DRI in cooperation with the U.S. Department of Commerce/International Trade Administration notes that "perhaps more than any other segment of the environmental industry, the solid waste business is driven by economic and social forces more than regulatory pressures".

2. Industry is evolving away from an orientation of pollution control to one of pollution prevention and waste minimization.

- Historically, environmental compliance efforts have focused principally on treatment of waste once it has been released. This end-of-pipe approach looked at compliance as being a cost, with little emphasis focused on the opportunity for material and energy efficiency.

- Pollution prevention and on-site recovery systems can often not only lower energy and material usage but also reduce treatment costs and lower liability and insurance costs.

- Many industries are increasingly examining their raw material usage, waste management practices, manufacturing processes and products produced in a continuous effort to reduce environmental costs.

- Pollution prevention efforts by generators in certain industry sectors has led to a decline in the amount of as-generated waste requiring third party management. This has contributed to industry consolidation and the emergence of niche players who provide specialized products and services to specific industry sectors.

A major study conducted for the U.S. Congress[1] made the following points on pollution prevention:

- Compared to conventional treatment alone, pollution prevention and recycling investments are usually more cost-effective, often resulting in reduced energy and material usage and lower end-of-pipe treatment costs. Pollution prevention can produce significant environmental benefits as well, including reduced cross-media transfers and reduced environmental impact from avoided energy and materials usage.

- While increased reliance on pollution prevention and recycling offers a means to reduce the conflict between environmental protection and industrial competitiveness, it does not eliminate it. While much pollution prevention and recycling options yield net positive rates of return equaling non-environmental investments, many others do not and often cost money. However, in most cases the expense is lower than alternative end-of-pipe approaches.

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[1] Industry, Technology and The Environment, Competitive Challenges and Business Opportunities, U.S. Congress Office of Technology Assessment, 1993

- While source reduction is normally preferred on environmental grounds, and usually yields the lowest cost option for reducing pollution, there are cases where recycling is preferred on economic grounds. Depending on the material, the size of the facility, and the industry, recycling can be a more economical way of reducing waste than source reduction. Moreover, recycling can be the preferred option if it is less intrusive to the production operations.

- Emphasis on pollution prevention can also lead to beneficial organizational and technological changes. It can speed technical change within an industry, leading to increased investment in new plant and equipment. Moreover, integrating pollution prevention into industrial operations can lead firms to pay closer attention to the efficiency of their production processes and is consistent with new management approaches, including total quality management.

- A variety of evidence suggests that, while industry has increased its pollution prevention and recycling efforts, particularly since the late 1980's, significant pollution prevention opportunities still exist, especially those related to process modifications. A number of organizational and capital accounting factors within firms and aspects of the regulatory systems retard greater progress.

- While new technologies are necessary for fundamental gains in pollution prevention, widespread diffusion of existing off-the-shelf technologies will go a long way to reduce pollution.[2]

A brief overview of Ontario's efforts and progress in pollution prevention is provided in Section 3.5.

3. Generators of waste are increasingly looking to outsource any environmental service that is not consistent with their core competencies. There are two main drivers:

    - Global competitive pressures create a focus on cost-effectiveness.

    - Outsourcing employs service specialists that reduce the cost of environmental compliance and improve overall profitability.

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[2] Industry, Technology and the Environment, Competitive Challenges and Business Opportunities, U.S. Congress Office of Technology Assessment, 1993

4. The waste management supplier industry will continue to experience increasing consolidation.

    - As the waste management industry matures there is less demand for third party waste management due to prevention efforts.

    - The industry will likely continue to be structured with a few very large companies and many smaller players addressing specific niches. Medium sized companies will be targets for acquisition.

    The acquisition by Canadian Waste Services of a number of companies, the merger of Laidlaw Environmental Services with Rollins and the acquisition of Laidlaw Medical Services by Med-Tech Environmental are more recent high-profile examples of the move to consolidate.

3.2 Key Industry Issues

In addition to the major trends discussed above, the following issues were viewed by focus group and interview participants as key to the current and future state of the waste management industry.

Generators

Waste generators interviewed mentioned the following issues.

1. *Definition of hazardous waste*

    - From a generator's perspective the designation of certain waste streams as hazardous makes it difficult to manage these materials other than through landfill or incineration as such wastes cannot easily be used as raw material for reuse or recycling. This could stem from a lack of clear understanding on both the definition of hazardous waste and the regulatory requirements on the part of waste generators.

2. *Lack of economic 3R options for small quantity waste generators*

    - Most industry sectors are comprised of many small companies that lack the financial resources to afford pollution prevention or waste minimization technology.

    - Furthermore, these companies do not generate sufficient waste quantities to develop programs to source separate materials for recycling. In many cases, materials which could be recycled are collected and disposed of due to a lack of economical solutions.

3. *Waste export*

   - There is a concern that any waste being exported to the United States may be disposed of in landfills that might eventually be designated as Superfund sites. U.S. legislation is such that liability extends back to the original generators and users of these sites.

   - Generators would prefer to have Ontario-based solutions that keep employment and revenue in the provincial economy and which may lead to development of other business opportunities for Ontario firms.

4. *Consolidation in the waste management industry*

   - There is a concern that as the waste management services industry continues to consolidate, this could result in:

     - Higher prices due to lack of competition
     - Less innovation in 3R options

5. *Poor public perception*

   - There is a common concern that environmental problems are always publicized by the media. Environmental success stories are not well known by the general public.

6. *Need for regional solutions*

   - The remoteness of many regions, coupled with the continued restructuring of provincial government services such as healthcare, indicate that waste management systems need to be designed to take account of regional differences in demand, service availability and funding.

Suppliers

Suppliers of waste management products and services mentioned the following issues.

1. Definition of hazardous waste

   - As with generators, some suppliers in our study believed their options for providing waste management solutions are reduced because small levels of contaminants can designate wastes as hazardous, potentially preventing use as a raw material input in another manufacturing process.

2. *Financing*

    - Smaller waste management companies have difficulty raising capital for start-up or expansion, and some have a perception that traditional financing institutions tend to view these companies as risky compared to other industries. For further discussion of this issue, refer to Section 6.1.

3. *Public perception of the industry is poor*

    - The public generally has a poor perception of the industry. For example, implementation of innovative 3R or waste management solutions may be restricted due to the "not in my backyard" (NIMBY) syndrome. Many suppliers indicated that Canadian made waste management technology success stories need to be better publicized.

4. *Competition between management options*

    - Some private recycling companies are concerned that as new waste management treatment and disposal options become available in Ontario, they may have difficulty competing economically for supply. For example, in the solvent recycling area, permitting cement kilns to accept and treat chemical and hazardous wastes may negatively impact recycling operations which "add value" by producing a secondary raw material.

5. *Consistent enforcement of regulations*

    - Many respondents clearly felt there is a need for government to consistently enforce regulations to ensure a level playing field.

3.3 Strengths and Weaknesses of the Industry

Based on responses from the interview process and a review of secondary research, the following page provides a summary of the broad strengths, weaknesses, opportunities and threats of Ontario’s industrial and hazardous waste management industry.

Strengths and Weakness of The Ontario Industrial and Hazardous Waste Management Industry

Strengths	Weaknesses	Opportunities	Threats
· The existence of relatively strong regulations has forced private industry to develop competitive products and services. · Canada is recognized as an environmental leader, which benefits Ontario companies in international marketing activities. · A sophisticated scientific, educational and social infrastructure that supports the waste management industry, including a strong R and D infrastructure in universities, colleges and research institutions such as the National Research Council (if exploited). · A network of organizations and technology transfer centers designed to move new environmental technologies into the commercial marketplace, including the Ontario Center or Environmental Technology Advancement · Continuous efforts by government to open up selected foreign markets to Canadian companies such as Team Canada trade missions and market intelligence reports	· Many small companies lack the critical mass to compete internationally. · The industry does not actively seek partnership opportunities. · Many companies are managed by operational or technical experts, and lack marketing, finance and business development skills. · The Canadian government does not have the financing clout of the U.S, Japan and Europe in international markets, therefore there is less opportunity for Canadian firms in many large environmental projects funded by these countries.	· Partnerships and alliances between smaller firms can help them put together complete solutions, especially in foreign markets · The federal government development of Latin American markets (among others) has created a very positive environment for Canadian firms. · The industry shift to pollution prevention creates opportunity for firms to work with generators throughout the production process.	· Any reductions in regulation or enforcement may reduce incentives for new or innovative solutions. This may reduce competitiveness in the future. · Industry's shift to pollution prevention will reduce demand for end-of-pipe disposal and threaten businesses who are unable to offer up-stream products and services · Continued consolidation of the industry may reduce competition and the drive to innovate.

3.4 Size, Growth and Composition of the Industry

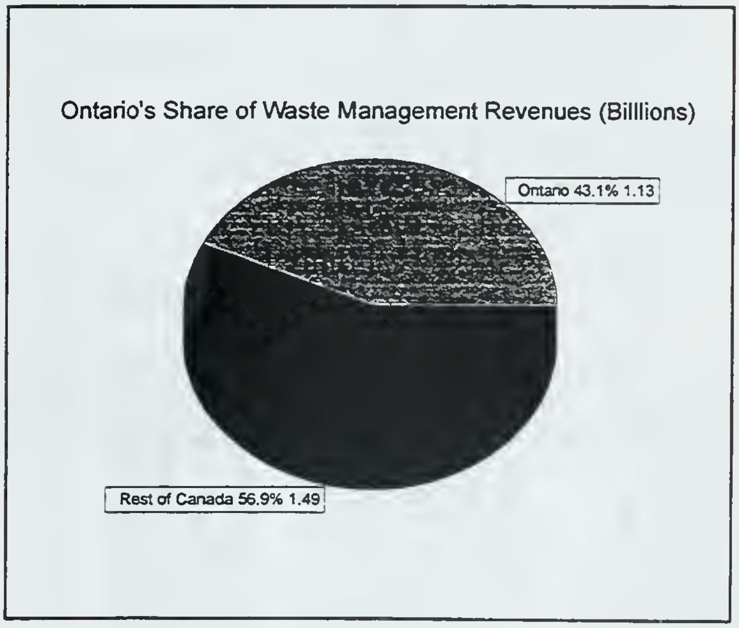
This section provides information on the size, growth and composition of the Ontario industrial and hazardous waste management industry.

There is a lack of comprehensive and timely data for specific industrial segments such as industrial solid and hazardous waste. This section therefore uses the most recent Statistics Canada information to address the size and composition of the industry and draws upon the recent OCETA survey to address growth and more detailed sales breakdowns. For indicative purposes we have also referenced U.S. sources to help provide information on industry segment growth. Please note that each of these sources define the industry differently. These definitions have been included or footnoted where appropriate.

3.4.1 Industry Size

All figures presented below in section 3.4.1 are from the most recent waste management study by Statistics Canada[3] which is based on 1995 data and includes all types of waste management activity in the business sector (definition is footnoted below - government activity is excluded).[4]

Operating Revenues:



Ontario accounted for 43% or $1.13 billion of the Canadian revenue total of $2.61 billion in 1995.

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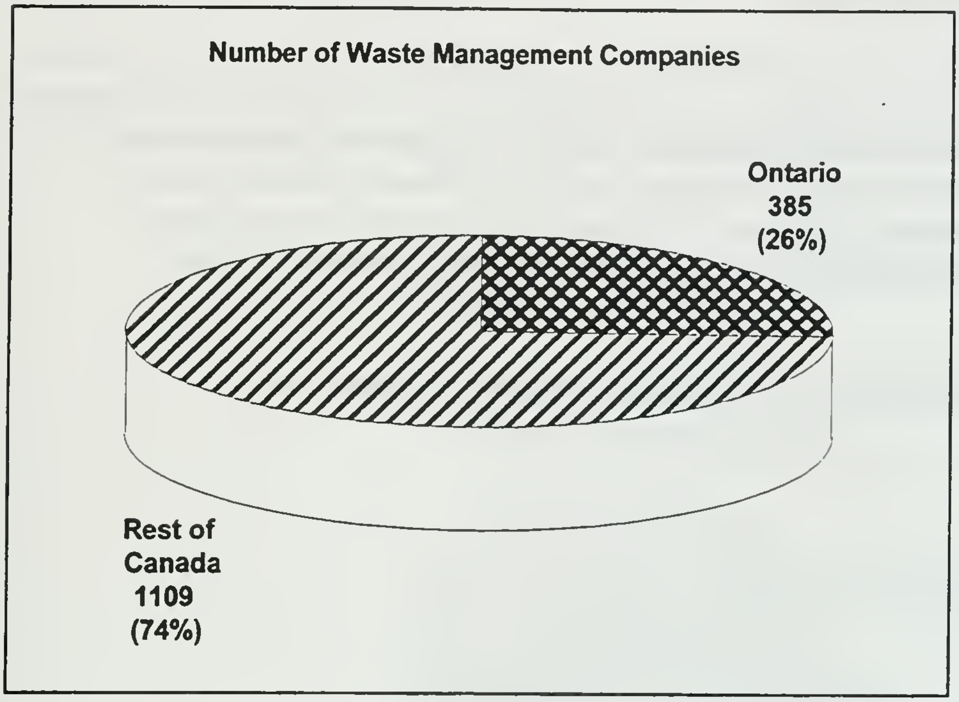
[3] Statistics Canada: *Waste Management Industry Survey: Business Sector, 1995*

[4] Includes companies engaged in the following: collection and transportation of waste and materials destined for recycling, the operation of non-hazardous waste disposal facilities and the treatment and disposal of wastes deemed to be hazardous.

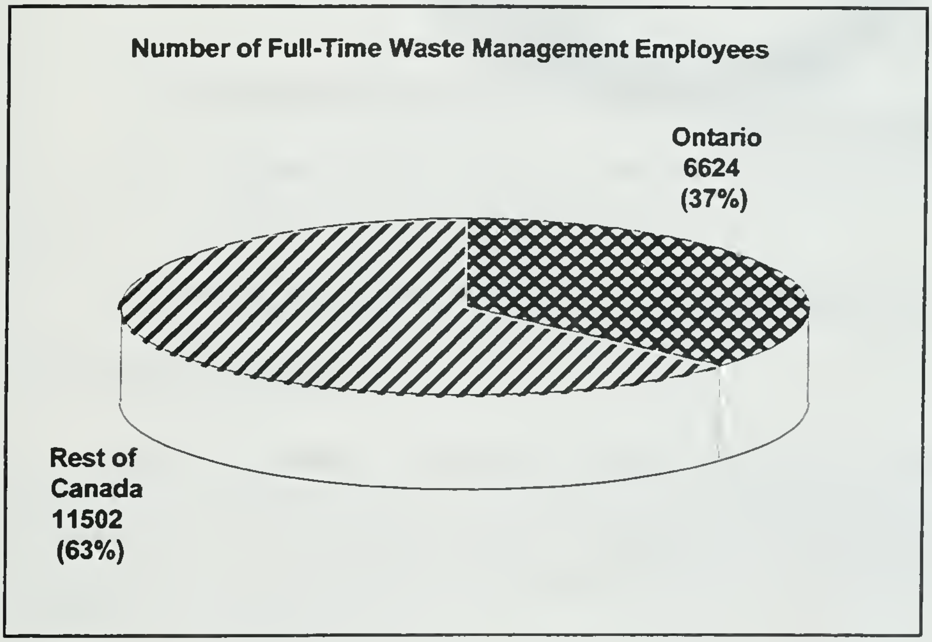
Number of Companies:



Statistics Canada reported 1494 companies engaged in all types of waste management activity in Canada, with 385 or 26% of these located in Ontario.

Note: The 1997 OCETA Survey of Ontario Waste Management broke out solid and hazardous waste management companies separately from the total and estimated there were 332 such companies in Ontario.

Number of Employees



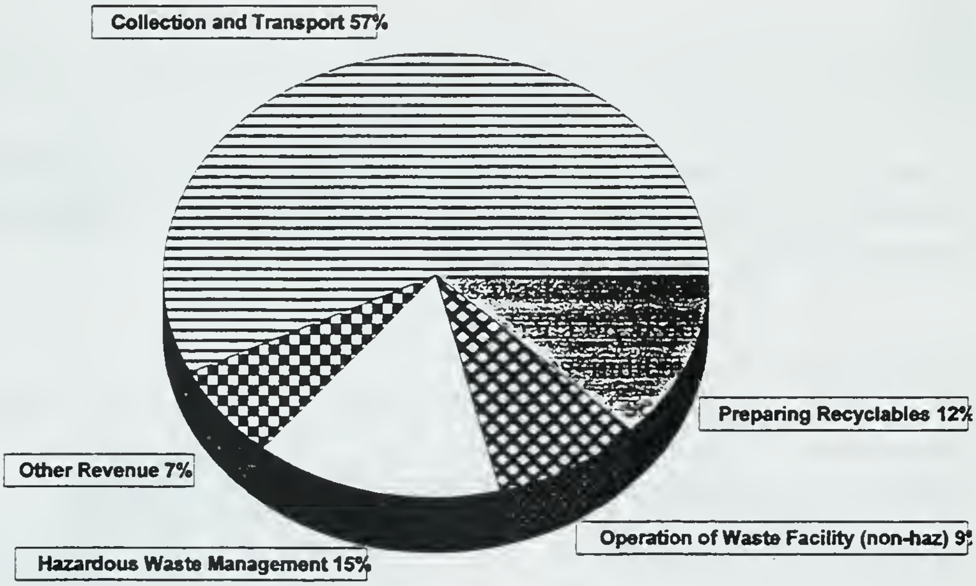
In 1995 Ontario companies reported 6,624 full-time employees in Ontario, almost 37% of the Canadian total.

3.4.2 Composition of the Industry

Composition By Activity:

Specific breakouts of industrial and hazardous waste management segments are not available, however, the most recent Statistics Canada breakdown of overall waste management industry activity, based on 1994 figures, indicates the largest industry revenue source is the traditional collection and transport segment of the industry.

Distribution of Waste Management Revenue by Type of Activity

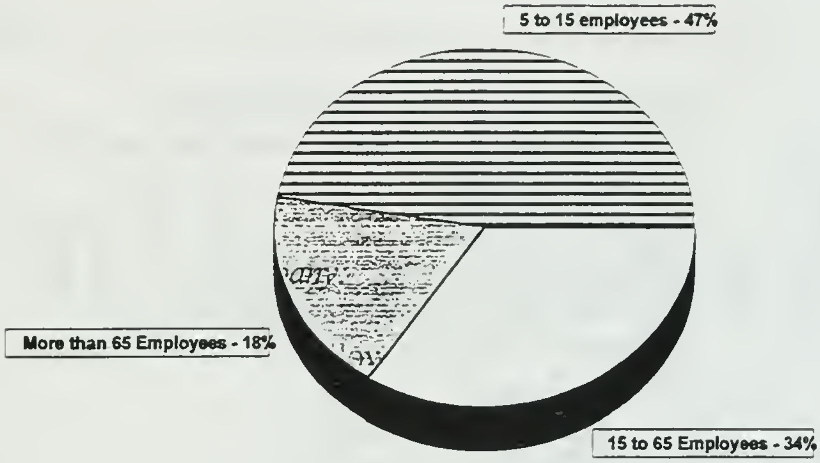


Source: Statistics Canada: 1994 Waste Management Industry Survey: Business Sector (Ontario companies only).

Composition By Size of Company:

Statistics Canada provides the following breakdown, by number of employees, of companies involved in the overall waste management industry with 5 or more employees. The largest number of companies tend to be small (under 15 employees).

Composition of Waste Management Industry by Size of Company



Source: *Statistics Canada: 1994 Waste Management Industry Survey: Business Sector (Ontario Companies Only).*

3.4.3 Industry Growth

In this section we summarize information currently available on industry growth in Canada and the United States, which may serve as a helpful indicator of industry growth expectations. For information on Ontario companies OCETA augmented its 1997 Economic Survey of the Ontario Environment Industry (The methodology for this survey is attached as Appendix D).

For the purposes of the OCETA survey, companies identified themselves as having solid and hazardous waste management products and services according to the following definitions:

Products	· Hazardous waste storage/treatment equipment · Waste collection equipment · Waste disposal equipment · Waste separation equipment · Recycling equipment · Incineration equipment
Services	· Emergency response and spills cleanup · Waste handling - collection, transport, transfer stations and disposal · Operation of sites · Ownership/management of sites · Recycling (sorting, baling, cleaning) · Operation of recycling plants (materials recovery facilities) · Hazardous waste management · Medical waste management · Nuclear waste management.

OCETA survey respondents were asked what their growth expectations were for 1996-1997 and through the year 2000 and responded as follows:

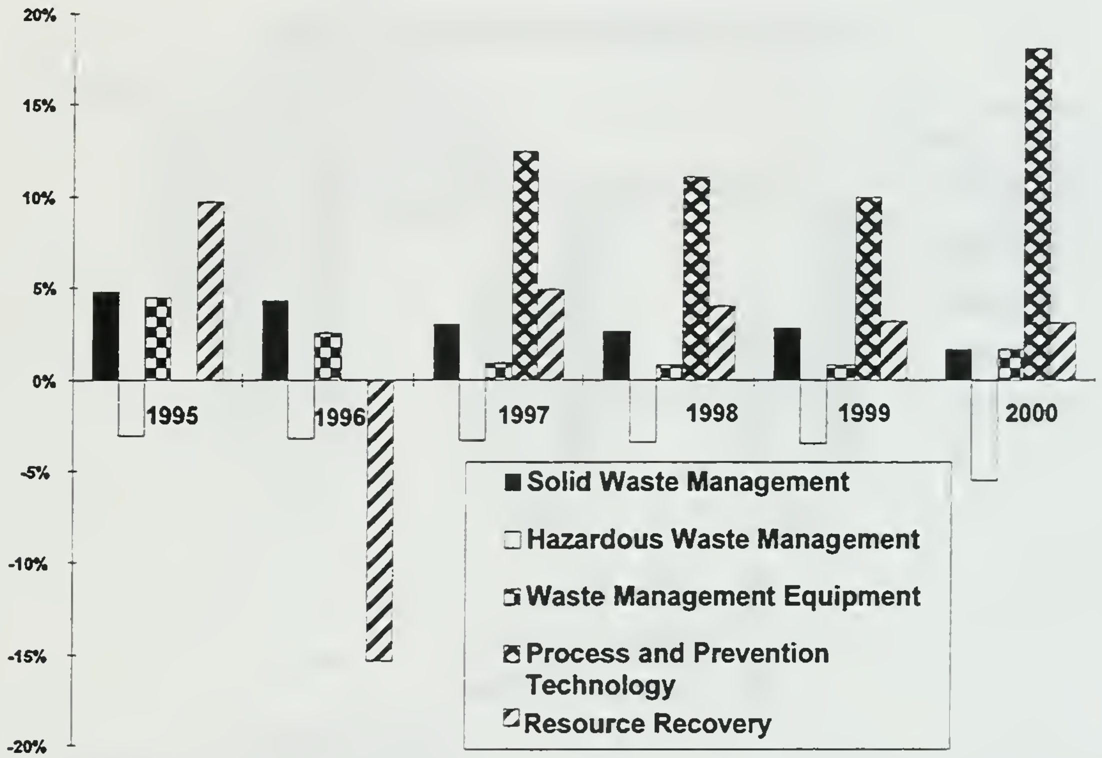
	1995-1996 Actual	1996-1997 Projected	1997-2000 (CAGR) Projected
Sales	-5.5%	6.5%	12.8%
Employment	3.1%	7.7%	2.6%
Wages	4.1%	6.8%	2.7%

CAGR - Compounded Annual Growth Rate

The OCETA respondents appear bullish about their prospects, particularly from a sales standpoint. However, projections for the United States, with a much larger industry base, show a less optimistic picture.

United States Growth Estimates:

U.S. studies indicate a flat or declining growth rate for most aspects of solid and hazardous waste management. However, there are some areas of potential growth. The following chart, based on figures from the Environmental Business Journal Annual Industry Overview 1997, outlines historical and predicted growth in various industry segments.

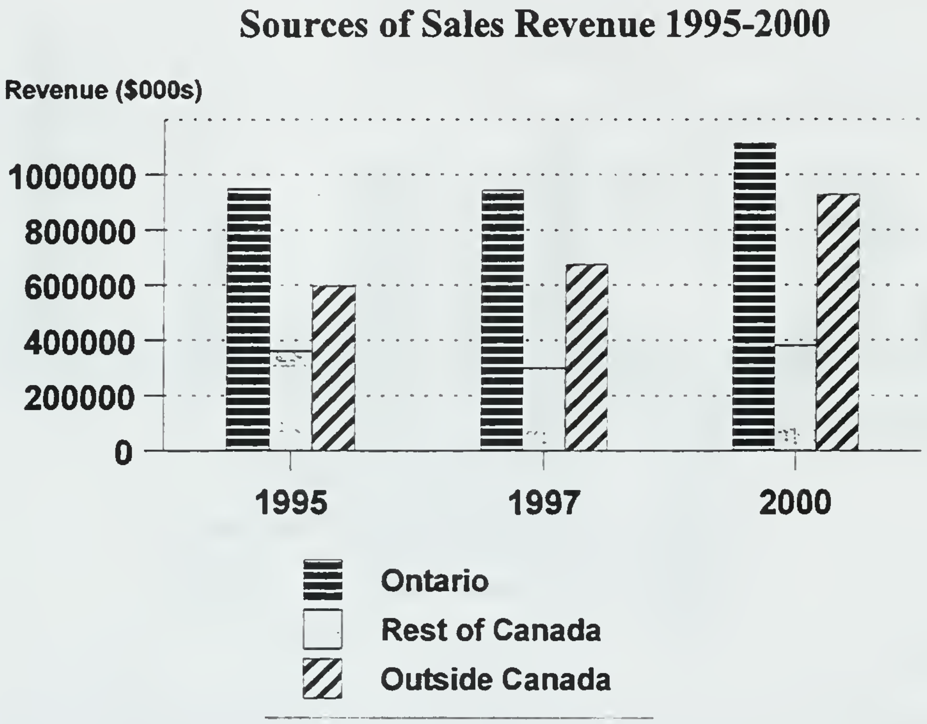


The chart clearly illustrates that while traditional solid and hazardous waste management segments are showing low or declining growth, the process and prevention technology segment is expected to grow very quickly. This is consistent with an industry that is moving from an end-of-pipe to a pollution prevention focus.

3.4.4 Composition of Sales Revenues:

The 1997 OCETA Economic Survey of the Ontario Environment Industry, augmented during this study, provides further breakdown of the sales activities of Ontario-based companies.

Source of Sales Revenue:

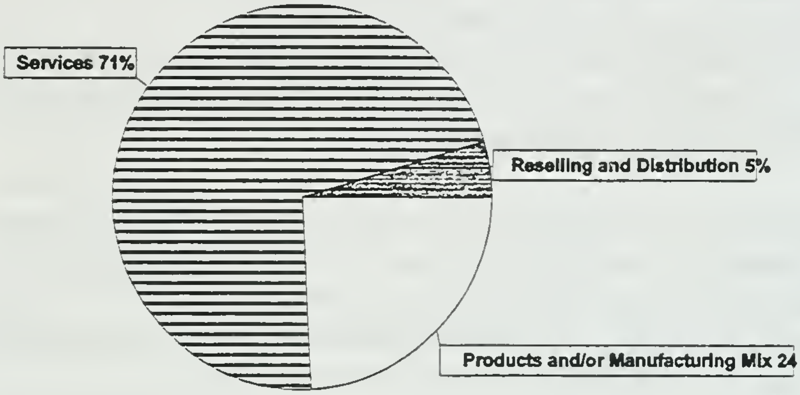


Type of Sales Revenue

Also covered in the OCETA survey was the type of sales revenue. The following charts indicate the breakdown of sales revenues according to whether the sales revenues are product, service or distribution based.

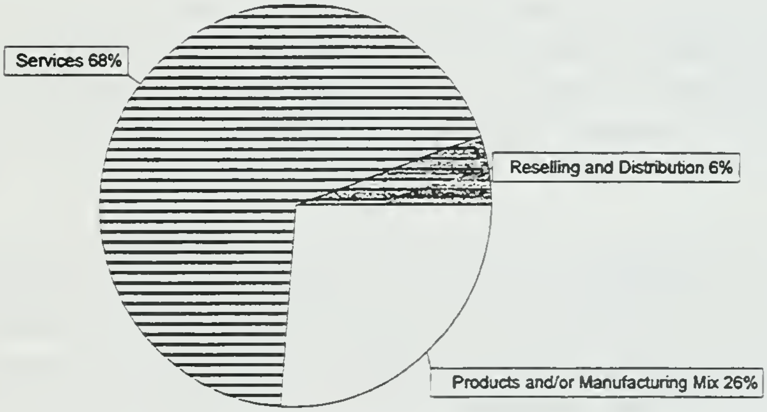
TYPE OF SALES REVENUE

1997



The chart indicates that most of the sales revenue expected in 1997 will come from services.

2000



When asked about the product/service distribution mix in the year 2000, respondents indicated an increasing proportion of revenue will be derived from products.

3.5 Pollution Prevention and Protection of the Environment

This section of the report provides an overview of Ontario's efforts and progress in pollution prevention initiatives. It also provides a summary of the quantity of waste materials diverted by the industrial and commercial sector.

Pollution Prevention

Pollution prevention offers significant advantages over traditional environmental and waste management approaches. The focus is to anticipate and prevent pollution, reduce the use of toxic chemicals and minimize the generation of industrial wastes. Efforts of this nature not only result in the protection and preservation of the ecosystem, they also provide industry with opportunities to improve operating efficiencies, reduce operating costs, decrease environmental risk and limit liability.

In Ontario, pollution prevention efforts have been successfully implemented through a number of innovative partnerships between government at all levels, industry associations, private companies and community groups. One approach has been the use of voluntary partnerships. For example, the Ontario MOE has entered into a number of Memorandums of Understanding (MOUs) with various stakeholders.

A MOU is a formal agreement which is voluntarily entered into and that establishes a partnership among the signatories. Under the agreement, the partners establish common goals, develop tools, identify plans, implement projects and undertake training. The partners also promote and increase awareness of pollution prevention principles.

To date, the MOE has developed MOUs with five industry sectors: auto parts manufacturers; chemical producers; metal finishers; motor vehicle manufacturers; and printers. A summary of company participation in these sectors and reductions reported in the use, generation and release of toxic substances and wastes are summarized in the table following:

MOU Participation and Toxic Material Reduction

Sector	**Participating Facilities**	**Number of Case Studies**	**Toxic Material Reductions (tonnes/yr)**
Auto Parts Manufacturers	8	22	660
Canadian Chemical Producers	11	15	12,000
Metal Finishing	17	14	287
Motor Vehicles Manufacturing	28	66	152,000
Printing and Graphics	7	2	52

Source: Ontario Ministry of the Environment, Program Development Branch, Pollution Prevention Office, Ontario's Progress in Pollution Prevention, August 1997

The MOE has also developed partnership agreements with other industry sectors, municipalities and community organizations. These agreements differ from MOUs in that they are not delivered through formalized agreements. They also address other objectives in addition to pollution prevention such as improvements in waste handling, business management and worker health and safety.

For example, the Emery Creek Environmental Association Industrial Community partnership is a co-operative effort by the Ontario MOE, Environment Canada, the new City of Toronto, the Great Lakes Pollution Prevention Center, the Emery Creek Environmental Association and participating local businesses. The goal of the partnership is to encourage the 2,500 businesses and industries in the Emery Creek watershed to reduce wastes at source.

Additional details on pollution prevention initiatives in Ontario are contained in the MOE document entitled "Ontario's Progress in Pollution Prevention" dated August 1997.

Waste Diversion

In addition to pollution prevention initiatives, there have also been significant efforts by industry to divert waste from disposal through reuse and recycling.

The Waste Management Policy Branch (WMPB) of the Ontario Ministry of the Environment facilitates efforts to divert wastes through reduction, re-use and recycling.

The following data from the WMPB provides an estimate on the tonnage of waste diverted from the industrial, institutional and commercial (IC&I) sector in Ontario in 1994 and 1996.

Year	*Amount of Waste Diverted*
1994	825,000 Metric Tonnes
1996	858,000 Metric Tonnes

It should be noted that these are conservative estimates only on the amount of industrial waste materials currently reused and recycled in Ontario. The data that is available represents only "Blue Box" type materials diverted by the IC&I sector such as fibres and glass, metal, aluminum and plastic packaging containers. It excludes diversion efforts of the following waste streams:

- construction and demolition waste diverted by private waste companies
- road construction and demolition debris diverted by public and private companies
- organic wastes from the food processing and service industry that is diverted to animal feed or other management methods
- materials diverted from reuse and recycling efforts by heavy industry

4.0 OPPORTUNITIES IN THE INDUSTRY

This section of the report describes some opportunities that are available to Ontario-based companies in the industrial and hazardous waste management industry both from an individual waste stream and technology perspective. Opportunities for Ontario companies in international markets are described in Section 5.

4.1 General

In general, opportunities in the 3Rs component of waste management may be found where problematic waste streams exist. For the purpose of this study, a problematic waste stream is defined as one where:

- no satisfactory waste management option is available (e.g. high level nuclear wastes);
- no economical 3R (reduce, reuse or recycle) option is available compared to lower cost disposal based options such as landfill and incineration;
- no infrastructure is in place to collect and transport waste material to available reuse or recycling markets, for example, generators in Northern Ontario where high transportation costs to available markets would preclude development of 3R's solutions;
- no cost-effective technology is available to process waste material to meet industry market specifications; and
- no end-use market is available to use the waste materials as input into new product manufacture or other application.

4.2 Selected Industrial Waste Stream Opportunities

The following table provides a summary of selected industrial waste stream opportunities for Ontario-based companies. These are summarized by industry sector, waste type, current research activities and a list of key stakeholders to contact for additional assistance and market information.

SECTOR	WASTE TYPES	CURRENT ACTIVITY/OPPORTUNITY	KEY STAKEHOLDERS
Steel	• BOF and EAF slag • BOF and EAF dust • Spent pickle liquor and waste chromium solutions • BOF sludges • Flyash	• Various research organisations and industry conducting R&D to identify options to manage EAF dust • Trials completed on recycling slag as cement additive and use in road construction • Opportunity to develop joint solutions with metal plating and finishing industry, which also generates large volume of chromium wastes.	• Natural Resources Canada-CANMET • Steel Manufacturers • Metal Platers and Finishers • Environment Canada (feasibility study on central facility to process plating wastes)
Pulp & Paper	• Biosolids or sludges from waste water treatment systems and deinking processes	• Ontario Forest Industry Association (OFIA) completed survey on sludge generation and management practices • OFIA and MOE developing "best management practices" to utilize biosolids in silviculture, rehabilitation of pits, mines and quarries and land application • Potential need to develop cost-effective sludge dewatering technology	• Pulp and Paper Mills • OFIA • MOE
Automotive	• Auto Shredder Residue (ASR) • Polyurethane foam • Bumper covers • Body side mouldings • Used automotive filters	• Trial applications of ASR include: reducing medium in steel mill blast furnaces; alternative landfill daily cover; mixing ASR materials with recycled plastics to produce composite materials; and use as pyrolytic feedstock to recover chemical and fuels • Use of oil filters as iron substitute in secondary lead smelters	• Environment and Plastics Industry Council (EPIC) • American Plastics Council (APC) • National Research Council • Ontario Automotive Recycling Ass. • Canadian Petroleum Products Institute
Food Products	• Potato chip/snack food packaging	• Material is comprised of polypropylene with a vacuumized aluminum coating • An acrylic heat seal layer and ceran coating also act as recycling barriers	• EPIC • Packaging Manufacturers and Suppliers
Plastic Products	• Polyurethane foam in household furniture • Lumber wrap • Polypropylene strapping • Videotape (polyester with oxide coating) • X-ray films (silver content)	• Key factors are establishment of collection and recovery infrastructure, development of process technology and availability of end-use market applications	• EPIC • APC
Electronic and Computer Products	• Electronic circuit boards • Cathode ray tubes • Variety of plastics	• Current efforts include re-manufacturing and disassembly to recover valuable raw materials • All electronic products will require "end-of-life" management • Estimated in the U.S. that over 12 million computers are disposed of annually, excluding equipment currently in storage	• National Safety Council's Environmental Health Center (EHC) and U.S. EPA • Computer and Electronics Manufacturers
Textile Products	• Carpeting	• End-product applications tested include use in fibre reinforced concrete to reduce cracking; moulding compounds; and soundproofing panels • Most valuable component is nylon polymers in face yarn • Need to recover value from old carpets in a cost-effective manner	• Carpet & Rug Institute • Carpet Manufacturers • Major Nylon Resin Producers
Miscellaneous	• Foundry sands • Wood • Organics • Tires • Building materials • Construction and demolition materials	• Various alternative approaches to disposal have been investigated and implemented with some success • Widespread need to develop more cost-efficient approaches	• Various

Source: OCETA

The opportunities described in the opposing table can be characterized in the following manner:

1. Hazardous Waste Streams

   Wastes designated as hazardous represent a financial burden to generators because of high treatment and disposal costs and potential liability from disposal in landfill. An example of this waste stream is Electric Arc Furnace (EAF) dust from steel making operations.

   Problematic waste streams of this type present a potential business opportunity for companies who can develop commercially viable process technology.

2. Partnerships with Research Organizations

   In some industry sectors, considerable research and development has been made to investigate more cost-effective ways to reuse, recycle or treat waste streams. For example, the Canada Center for Mineral and Energy Technology (CANMET) of Natural Resources Canada has researched various ways to treat and reuse wastes from steel making operations such as EAF dust.

   Partnerships or licensing agreements with research organizations such as CANMET and the National Research Council (NRC) to exploit the market potential of waste management technologies and processes may be a source of opportunity for Ontario companies.

3. Research and Development

   There are some industrial waste streams for which little or no R&D work has been conducted. Examples of these include various plastic materials generated by the automotive and other industry sectors, and electronic and computer products.

   These areas have not yet been thoroughly researched and hold opportunities. More market research is required to determine the volumes, composition and generation sources for these wastes; to identify potential end-use applications; to detail barriers and constraints for recovery; and to determine R&D needs for technology development.

4. "Second Look"

There are some waste materials, which typically comprise a large portion of the total waste stream, that have been primarily disposed of despite the availability of 3R technologies and reuse and recycling markets. Examples of these include pulp and paper biosolids, organic food wastes, building materials such as shingles and drywall, and construction and demolition debris. The main reason for this has been economics; it has been generally cheaper to dispose of these materials in landfill.

There is an opportunity for Ontario companies to take a second look at reusing or recycling these waste streams. This would include a market analysis to identify any improvements in process technology or changes in end-use market demand.

There are examples of companies taking a second look at reusing industrial waste materials. For instance, in the natural resource sector, zinc producers are now recovering and reusing waste zinc previously stored in ponds. These efforts have been driven by increases in virgin zinc commodity prices.

Increased recovery efforts by natural resource producers to use waste materials may also provide an opportunity for recycling companies to develop processing or "tolling" arrangements with these producers who may want to outsource this activity.

The above represent four types of opportunity for Ontario based companies in both Canadian and U.S. markets. They may also represent export opportunities in developed countries that have similar industry sectors to North America such as the steel and pulp and paper industry. A detailed business case analysis is required to explore each of these opportunity areas in further detail.

4.3 Waste Management Technologies

In general, technology development in the waste management industry can be characterized as a continuous improvement process (i.e., more evolution than revolution). For the most part, companies are using and modifying existing and proven technologies to manage waste streams in a more energy efficient and cost-effective manner.

A key factor is that a new or emerging technology has difficulty competing with conventional technology primarily due to economics (customers not willing to pay a premium) and that they are unproved in the marketplace. Companies are also not prepared to risk limited investment capital in an emerging technology.

Some examples of existing technologies that are being modified and used in new waste management applications are as follows:

- In the plastics sector, extrusion and compression moulding technology is being used by Ontario companies to produce composite products made from recycled plastic and other waste materials. For example, Lex Technologies Inc. has developed a composite material processing system that can take a wide range of waste materials and convert them into industrial products such as pallets, corner board, sheets and paving stones. Dura Products International Inc. manufacturers a composite material from post-consumer and post-industrial cellulose and high-density plastic material. Dura uses this composite material to produce a pallet product.

- In the electronics sector, an Ontario company through a partnership arrangement with a foreign firm has developed an automated metal separation and recovery system for computer products. Standard technology being used and modified includes shredders, granulators, magnets and eddy current separators.

- In the chemical industry, Philip Services Corp. has entered into a joint venture with the BASF Group to modify an existing technology to recover polyols from plastic polyurethane waste materials widely used in the automotive industry. The chemical process, called glycolysis, involves grinding rigid polyurethane waste to a specific size and adding granulate to a reactor containing solvents such as glycol and other chemicals. The mixture is heated to generate the necessary reaction to produce a polyol that can be used as virgin material.

Other examples of proven technologies being used in new applications include:

- the waste oxidizer system developed by Eco Waste Solutions which is based on thermal oxidation technology to treat a variety of waste streams such as medical, industrial liquid and hazardous wastes;

- the use of pulping technology from the pulp and paper industry by Knowaste Technologies to process post-industrial diaper waste to recover fibre and other materials;

- use of hazardous and other selected waste streams as part of a fuel mix or as primary fuel at cement kilns, pulp and paper mills, power plants and industrial boilers. For example, cement kilns use waste tires for fuel.

There have also been new and innovative waste management technologies and products developed and commercialized for specialized applications. Some examples are as follows:

- In the plastics sector, the University of Western Ontario has developed an electrostatic plastic separation technology. The separation process relies on the principle of electrostatic charge transfer to sort different plastic materials.
- In the rubber sector, Recovery Technologies Inc. has developed a cryogenic technology that uses higher temperatures, reducing the energy expended in cooling the chemicals involved.
- In the hazardous waste sector, Eli Eco Logic International Inc. has developed a gas-phase chemical reduction reaction as an alternative to traditional incineration technology to manage a variety of organic hazardous waste streams such as PCBs, pesticides and dioxins.
- The waste generator industry is more conscious of environmental issues and is more willing to consider different approaches, provided they do not result in increased costs.
- In general, interview respondents indicated that technology is available or could be developed to address any waste stream in a more environmentally sound manner. The issue is that the capital costs to purchase and maintain this technology does not yet meet investment criteria.
- The only waste stream reported by respondents where no technology is available is for high level nuclear waste.

4.4 Alliance and Partnership Opportunities

In an industry where there are many smaller companies and where more generators, particularly overseas, are looking for "complete solutions", alliances and partnerships may open up a wide range of opportunities.

This section describes some examples of partnership models successfully being implemented in Ontario. Promotion of these types of models where applicable will strengthen industry in the face of external competition.

Alliance and Partnership Models

In this section we review various type of alliance and partnership models and value chain linkages that could be adopted for use by various stakeholders in the waste management industry.

Region of Durham Networks for Excellence Model

One innovative method to find potential alliances is based on a model currently being used in Durham Region. This involves the creation of Proactive Opportunity Development (POD) committees composed of firms who may be related on a vertical basis (e.g. firms in the computer industry) or a horizontal basis (e.g. manufacturing firms).

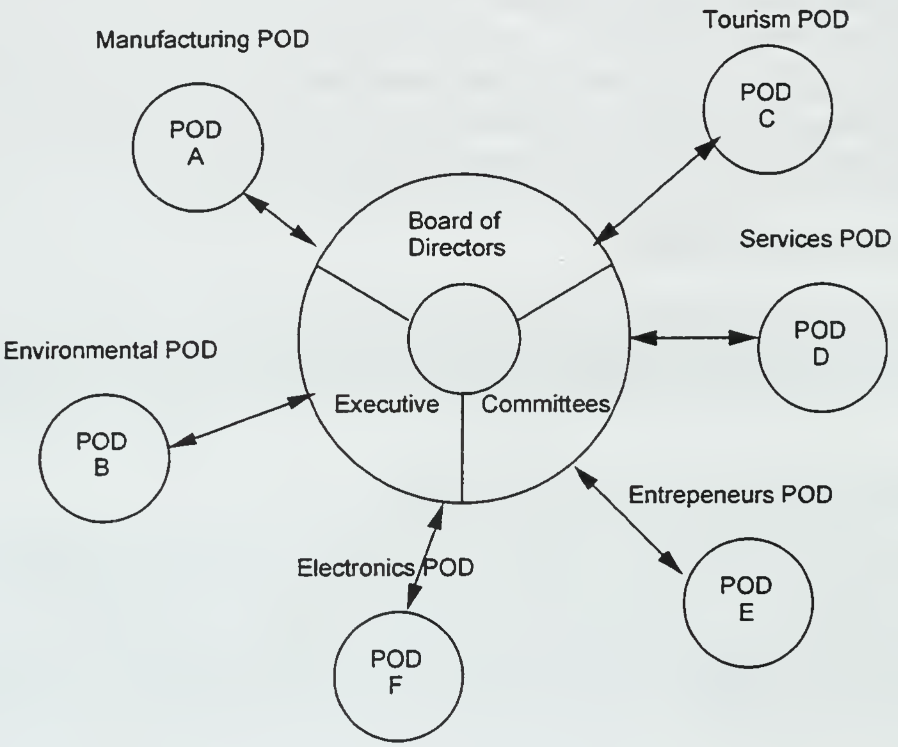
A variety of PODs have been established to reflect the region's industry base and manufacturing sectors. These include manufacturing, tourism, services, electronics, entrepreneurs and environmental. Individual firms participating include manufacturers, waste management companies, materials suppliers, engineers and consultants.

These PODS are linked to a central board of directors, providing strategic direction to the group and administration. The network structure is shown in the figure following.

Waste management companies in Durham Region have developed new business opportunities by participating in the network. For example, a company specializing in re-manufacturing linked with an engineering firm and a packaging company to develop an innovative solution for the reuse of computer printer toner bottles.

The organizational structure of the Durham model is illustrated in the following chart.

Durham Region Networks for Excellence Model



Partnerships Between Suppliers.

Another practical form of alliance is a supply chain or value-chain partnership. In this type of arrangement, companies work closely with related suppliers to specific waste generator markets to find customers and provide complete solutions.

Examples:

Gudgeon Brothers Ltd., a provider of thermal recycling products and services for foundry sand has set up a strategic alliance with major energy services providers. They work closely to identify target clients in the foundry and metal fabrication business who require both a large amount of foundry sand and a cost-effective energy solution. This overlap in markets creates an opportunity to work together. The energy supplier has the opportunity to provide value-added products, which are energy efficient, and the supplier of the thermal recycling has a broad and reliable distribution channel.

Another example is in the automotive area. One particular by-product is best dealt with using a specific chemical process. The provider of the waste management service works closely with the supplier of the chemical to find markets for this process which will ultimately result in more market for the chemical.

Generator-Supplier Partnerships.

Generator-supplier partnerships occur where the supplier of waste management services works closely with the generator from the design stage on through to the production cycle to ensure that by-products generated are re-used or recycled to the highest possible extent. These types of partnership are often part of outsourcing arrangements, where a supplier takes over various business functions related to waste management and other industrial services.

An example of this type of partnership is the one between Nortel and Philip Services Corp. Nortel sold their waste management services to Philip, and now work closely with them to ensure new products are designed to allow for efficient reuse and recycling. However, this type of arrangement is not limited to large companies; it can be applied to niche markets as well.

Another type of generator-supplier partnership is re-manufacturing, which is an emerging process in the high-technology field. In this model, a supplier takes the returned product, or in some cases waste product of the generator and re-manufacturers it, by reconditioning or replacing parts, to the same or higher standard as the original product. The re-manufactured product is then provided to the generator, who re-sells it through an applicable channel.

Ultimately the material will become waste, but the product life can be extended and there can be better control over disposal. It works best when combined with process design solutions addressing the ultimate recycling and disposal of the components.

The concept provides the generator with two benefits:

1. Reduced cost of manufacturing.

   Re-manufacturing is much less expensive than original manufacturing due to the lack of design and R and D costs as well as reduced materials and labour costs.

2. Control over the product life cycle.

   Many generators are concerned that once their product goes out the door they have no control over its use. The product can be altered and resold, in which case the consumer may still see the company logo and make inferences based on the quality of the product. It may also be disposed of in some unethical or illegal manner, which, although not the responsibility of the generator, may reflect negatively on them or be against their company policies on the environment. The concept has gained increasing acceptance but, in many cases is still regarded as detracting from sales of the original product, or is made uneconomical by low cost of new materials.

Eco-Industrial Networks or Parks

Historically, industries have been established in an isolated rather than an integrated fashion. Traditional manufacturing plants were located to consume raw materials, make products and dispose of wastes in response to regulations and economic considerations (Environment Canada, 1997).

Eco-industrial parks are industrial networks in which industries are linked to optimize energy, water and waste materials utilization. In an eco-industrial network, the wastes or outputs of one firm become inputs into the production process of another. Cost savings and improved revenues that can be obtained drive the network.

The U.S. President's Council on Sustainable Development in its 1996 Eco-Efficiency Task Force Report mentions the benefits of an eco-industrial park as follows:

> "By collectively managing environmental and energy issues, eco-industrial park members can enhance their environmental and economic performance and, as a result, achieve a combined benefit that is greater than the benefits each company would realize from optimizing only its individual performance"

Currently, there are about 30 eco-industrial networks operating in various stages of development around the world.

Examples of programs operating in Canada are as follows:

- in the Sarnia Lambton Industrial Complex, several refineries and large chemical producers have established energy and waste exchange projects including co-generation, hydrogen by-product exchange and brine collection and recovery;
- in Sault Ste. Marie, the local Economic Development Corporation in partnership with St Mary's Paper, Algoma Steel and other industrial firms have developed energy and waste linkages in a brown and green field industrial setting;
- in Dartmouth, Nova Scotia, the Burnside Industrial Park's Cleaner Production Center serves over 1,300 single and mall unit firms and has focused on facilitating improved linkages and waste reuse and recycling.

A program currently available to industry in Ontario is the Ontario Waste Materials Exchange. This program allows companies to list what materials they have available or want as raw material. The exchange attempts to make matches or create material linkages between waste generators and users. The exchange is now being operated by the Ontario Center for Environmental Technology Advancement.

5.0 INTERNATIONAL OPPORTUNITIES

In this section we review selected foreign markets for industrial and hazardous waste management products and provide an overview of opportunities. Since a detailed investigation of foreign markets is not possible given the scope and budget of this project, and the number of possible combinations of product and market, this section will:

- Provide an overview of international opportunities
- Indicate Ontario company interest and participation in these markets
- Outline potential barriers to market participation
- Summarize the Size of Country and Regional Markets
- Describe selected country markets and selected opportunities.

5.1 Overview

- Opportunities in foreign markets are affected by six major drivers:

  1. Degree of environmental awareness and regulation
  2. Degree of compliance and enforcement
  3. Industrial advancement
  4. Amount and type of waste
  5. Environmental funding sources and availability
  6. Degree of competition

  Opportunities can be broadly identified by matching the type of product or service offered to the state of particular regional markets.

  For example:

  Those regions, such as Western Europe, with a high degree of environmental awareness and regulation, and mature industrial advancement are less likely to seek end-of-pipe solutions. However, regions who have only recently become environmentally conscious, and whose industry has not built in pollution prevention, such as in much of Latin America, are more likely to be interested in solutions which may involve an end-of-pipe approach.

  In another example, China has recently introduced relatively stringent environmental regulations for industry which would indicate immediate opportunity for providers of waste management products and services. However, enforcement and compliance (and funding) lag behind the regulation, which delays the opportunity to help domestic Chinese firms. At the same time foreign firms with plants or facilities in China, particularly multinationals, often need to come quickly up to speed, either because they are often the first targets for enforcement, or because of company policy on compliance.

- Environmental funding is also a key driver. In Latin America and Asia, much of the funding for environmental projects comes from government and foreign aid programs, and/or lending by international financial institutions such as the Asian Development Bank or the World Bank. Opportunities may be found by understanding how specific products or services can fit into larger funded projects, possibly as part of a team or alliance.

  Many countries, in Asia and Latin America in particular, are encouraging privatized infrastructure, particularly projects proposed on a BOT (Build Operate and Transfer) model. In these projects the project developer is responsible for financing the project instead of the host government, with an expectation of ongoing revenue from customers.

- ISO 14001 compliance is being encouraged in many areas, particularly Latin America. This code provides a process and standard for companies to take measurable actions toward environmental responsibility. While not in itself a driver of waste management, it will encourage responsibility and must be understood by companies working internationally.

5.2 General Observations from the Industry

Companies interviewed had experienced mixed success in international markets. In general, responses indicated:

- Very high market interest and potential, especially in Latin America (Brazil, Mexico and Chile) and Asia (China and India)

- Excellent support available from the Department of Foreign and International Trade, when companies choose to use these resources.

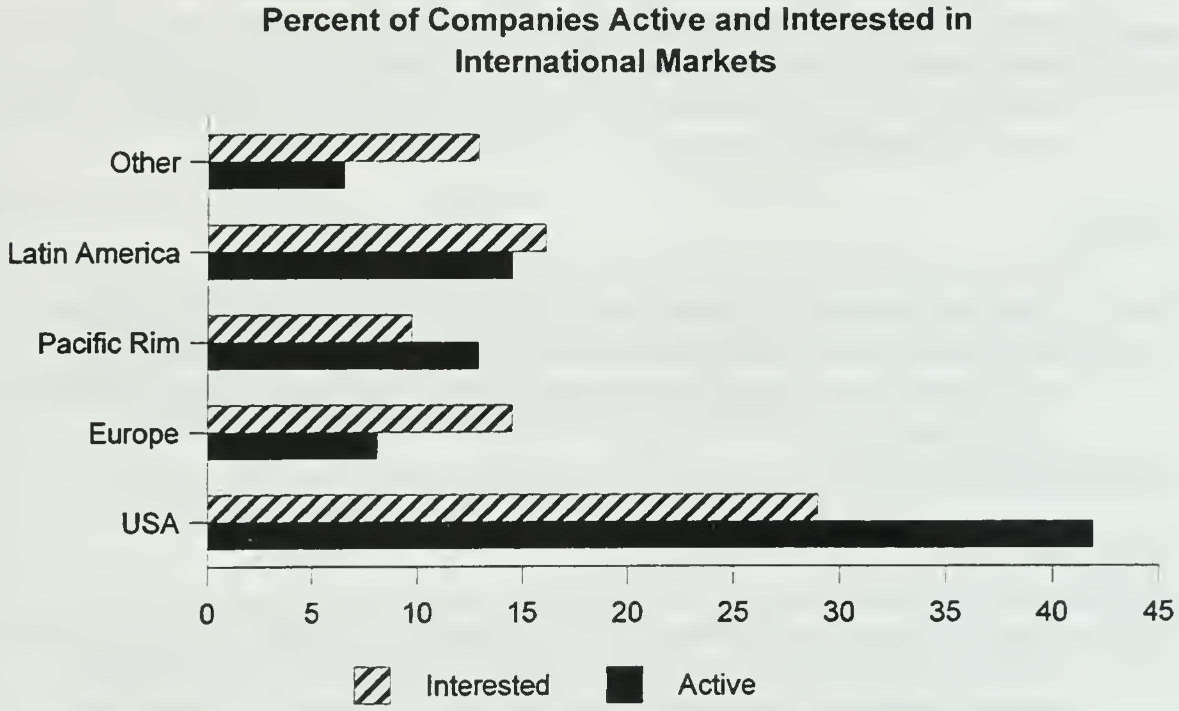
- Success in establishing contacts, and a good reception for their firm.

- Difficulty in exploiting export markets to their fullest potential, especially among smaller firms (see Barriers to Entry below).

- Strategic preparation was mixed, with many companies acting on an opportunistic basis.

5.3 Activity and Interest in Foreign Markets

The table following illustrates the level of activity in foreign markets by Ontario companies who responded to the OCETA survey of November 1997 and our update for this report. Not surprisingly, the United States is the most popular market due to size, proximity and similar requirements and business culture.



5.4 Barriers to International Market Entry

In this section we describe some of the problems Ontario companies encounter in entering international markets.

1. Size/Resources

   - Many of the study participants had explored foreign markets and found interest, but the work required to build and maintain business relationships was extremely onerous for small firms, particularly since many of these firms rely on senior management (such as the owner and president) to be on site to do market development.

2. Cultural

   - Suppliers recognize that business is conducted differently in other cultures. In some cases, the cultural gaps resulted in a company declining to participate in a market. Other companies work with international companies or local agents to bridge this gap, with the caveat described in Local Expertise below.

3. Local Expertise

   - Local presence is often essential in building the relationships necessary for success in foreign markets. Without local presence, knowledge of local business practices and market conditions may be limited. In some cases, using a distributor with local familiarity is a sound strategy. However, there are pitfalls.

     One company described their experience in engaging an international distributor for their product who had a strong presence in several international markets. Although the distributor was trustworthy and hardworking, sales were infrequent. The supplier believed this was due to the highly technical nature the product/service offering, which the principals of the supplier had learned over many years.

     It was difficult to transfer this knowledge to the distributor, with the result that sales were not closed, or required a high level of intervention by the supplier in Canada. The lesson learned is that agents and distributors are not always the best solution unless an effective transfer of knowledge and support are carefully thought out.

4. Lack of Preparation

"Often people think that sending a fax saying you are coming is all they (the Canadian Embassy) need and that the Embassy will do the research; but that's a mistake; you need to do your own homework."

Frank Scheme, Vice-President, Latin America, ADI International.
Quoted in DFAIT literature.

Interviews with trade officials and secondary research were consistent in their emphasis of the need for preparation for international market development, and then commitment to market development over a long period.

This preparation included, at minimum:

- Review of the information available from federal departments involved in international trade (cited below) such as DFAIT, Industry Canada and CIDA. This usually includes market reports on environmental opportunities in the target region/country, advice on market entry strategies and key contacts.
- Talking to existing business partners, customers and suppliers about potential overseas opportunities
- Review of industry and trade journals for information on international markets, e.g., Environmental Business Journal and Solid/Hazardous Waste Management magazine.
- Attending trade shows where international buyers of products and service can be met and contacts initiated.
- Assessing the ability of the company to support an international trade effort, taking into account that considerable business development and executive commitment will be required, including extended travel, and that sales opportunities will have a much longer time-frame than is the case in Canada, due the necessity of developing relationships.
- Once these basic steps have been taken, contact with the trade officers relevant to target markets in Ottawa and the target country can be initiated. It is much easier for them to help when the preparatory work has been done. They can provide additional advice and help arrange contacts.
- An extended local visit is essential to establish contacts, get information on the ground and better understand the cultural and business climate. There may be many such visits before useful relationships are developed and any sales occur.

5.5 Size of the International Market by Category and Geographic Opportunity

The following outlines findings on international markets for waste management services. The findings to date are organized in two tables:

1. Global Markets in Waste Management
   - organized by Region and Type of Service.
2. Selected Country Markets for Waste Management
   - by specific Country outlook and opportunity

GLOBAL MARKETS IN WASTE MANAGEMENT - COMPARATIVE SIZE

1994 ($ billion)

Region/ Type of Waste	USA	W. Europe	Japan	Asia	Latin America	Aus/NZ	Canada	E. Europe	Middle East	Africa	Total
W M Equipment	11.0	8.7	3.8	1.0	0.4	0.4	0.8	0.4	0.2	0.1	26.7
Solid WM Service	31.0	28.1	20.2	2.6	1.2	1.2	2.1	1.0	0.7	0.3	88.3
Haz WM Service	6.4	5.0	3.6	0.4	0.3	0.2	0.4	0.3	0.2	0.0	16.7
Totals	48.4	41.8	27.6	4.0	1.9	1.8	3.3	1.7	1.1	0.4	131.7

Source: The Global Environment Market & US Environmental Industry Competitiveness, EBI Inc., 1995

Notes: US, Japan and Western Europe account for 88% of revenues. Growth areas identified in the report are China, Indonesia, India, Thailand, Malaysia, Philippines, Chile, Brazil, Mexico.

COUNTRY MARKETS FOR WASTE MANAGEMENT - HIGHLIGHTS

Country	Size of Market	Future	Opportunities
USA	Solid WM: $32.5 billion (US)[5] Haz WM: 6.2 (0.8 med waste, 1.2 nuclear) Remediation 8.5 WM Equip. 11.7	Growth of 5% in 1995 revenues.	Growing markets for plastics recycling, tire recycling, construction and demolition, and of material recycling facilities. Pulp & paper are big investors in recycling[6]. $50 billion over next 30-40 years to clean up 1,400 radiation and waste sites at Hanford, and $26 billion to clean up test reactors in Idaho.[7]
Mexico[8]	5-10 million metric tons of Haz waste per annum. Only 6% is recycled and 94% dumped.		Main target industries are chemicals, petrochemicals, electronics, pulp & paper, leather, sugar.

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[5] The US Environmental Industry, August 1996, EBI Inc.

[6] Environmental Business Journal, Volume VIII, No. 11, November

[7] Marketing Environmental Products & Services to the US Dept. of Energy Sites at Hanford & Idaho National Engineering Laboratory, DFAIT, December, 1997.

[8] The Hazardous Waste Market in Mexico, December 1996, Team Canada, DFAIT

Brazil[9]	Total environmental market of $2.5 billion of which 5% ($125m) is for solid and hazardous waste.	Sao Paulo preparing waste management legislation by end of 1998. There is no hazardous waste storage and disposal in Rio and Sao Paulo.	Opportunities in medical waste solutions, recycling technologies, tire recycling.
Israel[10]	3.1 million tons of solid waste annually, 94% dumped.	Program to construct central landfill sites and 10-20 transit stations	Opportunities in restoration of existing 400 dump sites.
France[11]	$4.6 billion market for waste related goods and services in 1997. Recycling equipment market estimated at $295 million (US)	100 sites due for remediation. Growth of recycling projected to be 22.5% per annum.	Opportunities for recycling appliances, electronics, plastics

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[9] The Environmental Market in Brazil, December 1997, Team Canada, DFAIT
[10] The Environmental Market in Israel, January 1997, Adir Shapira for the Canadian Embassy, Tel Aviv
[11] The Solid Waste Market in France, September 1997, Team Canada, DFAIT

United Kingdom[12]	Recyclable collection market of $US 516.9 million according to Frost & Sullivan 137 m tonnes of industrial waste, 51 m tonnes of commercial waste, 87 m tonnes of building & demolition waste and 72 m tonnes domestic waste.	Recycling market growing at 12.2% per annum form 1997-2002. Co's over 200 emp. being requested to publish environmental policies. Incinerators to close due to not meeting EU standards.	UK considered poor compared to Europe. Growth areas are pharmaceuticals, vehicles, chemicals and plastics.[13] Open to imported technology more than many countries.
India	$0.5 billion market for equipment and services.[14]and hazardous waste market estimated at $120 million (US)	$0.5 billion projected to grow to $.0 billion by 2000, an increase of 20-25% p.a.(see 10)	Opportunities for common incinerators for industrial waste and biotech treatment of toxic waste.
Philippines	Total environmental market of $5.7 billion. waste management equip: $30m, solid waste management $90 m, haz waste management 10[15]	Government on verge of releasing hazardous waste policy.	Opportunities for incinerators of medical waste.

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[12] The Solid Waste Market in the United Kingdom: October 1997, Team Canada, DFAIT

[13] UK: Environmental Equipment and Services, DFAIT, December, 1997.

[14] Environmental Sector in India, DFAIT and International Trade Staff, 1996/97 planning cycle

[15] EBI Inc., referenced in The Environmental Industry Market in the Philippines, November 1996, DFAIT and Team Canada

Thailand	Waste management equipment: $50 million, solid waste management $210 million, hazardous waste management $40 million.[16]	Growth of the total market estimated at 25% p.a.	Plans to recover and recycle 10% of solid waste by 2001 and 15% by 2006.
Malaysia	Waste management market estimated at $239.2 Million (US)[17]		Opportunities for joint ventures under Malaysia's privatisation plan. Some Canadian success stories.

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[16] The Environmental Industry Market in Thailand, Team Canada, DFAIT, 1997

[17] ERM Malaysia referenced in The Environmental Market in Malaysia, January 1996, Team Canada, DFAIT.

5.6 Overview of Global Markets

The scope of this study does not allow for detailed examination of individual country market opportunities. However, the following section provides an overview of market characteristics of selected regions and countries. In order to provide a reasonable level of focus, the information is concentrated on emerging markets and the United States. Some references to Western Europe, a highly mature and competitive market, are referred to in the previous tables.

Except as otherwise noted, the information below is based on reports published by the Department of Foreign Affairs and International Trade, discussions with trade officers and organisations such as CIDA, as well as the impressions of companies participating in these markets.

5.6.1 Asia

- Asian markets hold very good longer term potential for Canadian companies in most areas of solid and hazardous waste management. The Asian market for solid and hazardous waste management was estimated at approximately $3.0 Billion (US) in 1995 by EBI.

- Demand is driven by an increasing awareness of environmental concerns, coupled with a high level of environmental focus by international financial institutions (IFIs) and non-governmental aid organizations (NGOs) who direct a very large amount of effort to this region. Most internationally funded investment projects now mandate that proper environmental studies and controls are in place.

- The recent decline in the Asian economy has had an impact on the potential market for services in the near to middle term. The impact will be felt most strongly on product sales and services to the private sector, which require hard currency or local financing.

  For this reason Asian markets, particularly those in countries most affected by the economic setbacks such as Thailand, Korea, Malaysia, and Indonesia, may not be as attractive in the short term. However, the need for waste management will not disappear and service will be required at some point.

Selected Country Discussions (Asia)

India

Areas of opportunity:

- Solutions for chemical waste from tanning and dyeing processes.
- Treatment of metal foundry waste
- Incineration of industrial waste
- Biotechnology to treat toxic wastes
- Consulting (in partnership with local firms) on solid and hazardous waste management

Overview

- Several respondents indicated India as a region with enormous potential. Although smaller in population than China, business practices in India appear to make it easier than in China to build viable commercial relationships, although there is a high level of state intervention in India as well.

- Although the average level of education is very low, there are a very large number of highly educated workers, particularly engineers.

    - The waste management industry in India is characterized by
    - High volumes of waste requiring management
    - Government awareness of environmental issues
    - Increasing enforcement

- India is receiving a high degree of attention from Industry Canada and DFAIT

China

Areas of Opportunity:

- Specific areas of concern/opportunity as identified in various sources:

    - Chromium and metal plating technologies
    - Biomedical waste management
    - Petrochemical wastes
    - Incineration technology

- Opportunities exist to work with multi-nationals who are often regulated first and who may have corporate environmental policies encouraging compliance.

Overview

- Many respondents view China as having the biggest long-term potential due to the enormous population, rapid modernization and limited regulation and enforcement to date. Both factors contribute to huge potential growth the demand for cost-effective waste management products and services.

  "Because of our limited technology, funding and administration ability, the handling and disposal of solid waste in China is still in its initial stage. Most procedures do not meet the environmental protection standards."
  (1995 quote from Chinese National Environmental Protection Agency official, from Environmental Business Journal)

Market Size

Segment	*Market Size (1997 estimate in $millions US)*
Waste Management Equipment	970
Solid Waste Management	600
Hazardous Waste Management	120
Consulting and Engineering	150
Total ($Millions US)	1840

Source: Environmental Business Journal, 1997

Waste Volumes

1. Estimated Volumes of Industrial Solid Waste	600 million tons
2. Estimated Volumes of Hazardous Waste	20-30 million tons

Source: Chinese government estimates as report by Environment Business Journal

- Recent legislation in China has addressed hazardous and solid waste management, including reporting, disposal standards and regulation of hazardous waste transfer. However, the mechanisms to implement and enforce this legislation are still under development.

- Financing of waste management projects is also a major barrier. Many larger projects are funded by such institutions as the World Bank and the Asian Development Bank.

- Smaller, private enterprise solutions are not common although they should grow as private enterprise expands.

- Competition is heavy, particularly from European and Japanese firms. This is often due to the ability of these firms to link opportunities to financing from their home governments.

- Efforts may be concentrated in industrial zones of regions/cities such as Shanghai and Beijing. Local authorities can have initiatives to encourage industrial compliance.

- Financing is critical. Companies interested in this region should work closely with the federal government, (DFAIT, Industry Canada and CIDA) to identify financing alternatives and funded projects. Alternatively, companies can identify opportunities to work with international firms supplying specific niche expertise on a project basis.

5.6.2 United States

Several respondents indicated in the interview process that the United States is still the best market for environmental products and services because of:

- Market size
- Proximity
- Cultural similarities
- High degree of regulation and enforcement

The size and characteristics of some major U.S. markets are outlined below.

Solid Waste

The total market for solid waste management has been growing but the growth rate has been declining recently, according to figures published in Environmental Business Journal.[18]

Year	Market Size ($US)	Growth Rate
1993	29.4 Billion	+4.3%
1994	31.0 Billion	+5.4%
1995	32.5 Billion	+4.8%
1996	33.6 Billion	+2.9%
1997	34.7 Billion	+2.9%

As is the case in Canada solid waste generators in the United States are continuing to focus on reducing the amount of waste sent to disposal through a variety of pollution prevention, waste minimization and recycling initiatives.

Hazardous Waste

- $4.2 Billion (USD) Total Market[19]
- Volumes and Revenues declining due to waste minimization
- Growth will be relatively flat through 2000.
- Shift from off-site to on-site treatment

Hazardous Waste Opportunities

- Continued growth in pollution prevention, including recycling, solvent recovery and vitrification.

- Operation and maintenance of on-site treatment facilities

- As in Canada, companies have an opportunity to provide more outsourcing of toxic waste management activities within the generator, working closely at all levels to minimize waste and provide disposal as necessary.

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[18] As quoted in Waste Management Markets, Richard K. Miller and Associates, 1997

[19] Environmental Business Journal

Nuclear Waste:

- Market opportunity remains very large, but the issues of long-term disposal location and technologies are still issues.

- Technologies being evaluated include various forms of bio-remediaton and fission-based transmutation to allow shortened half-lives.[20]

Biomedical Waste:

- Continued concern over the use of incineration.

- $1 Billion (USD) market estimate in 1996[21]

- Based on market size at the beginning of 1994, an average annual growth rate of 7.2% was estimated for the years 1994 through 1999.[22]

5.6.3 Latin America

Latin America is emerging as a region of very high opportunity for Canadian companies, due to the following factors:

- Increased environmental regulation
- Increased environmental awareness
- Environmental projects tied to funding sources
- Increased economic stability

The Canadian government has made considerable efforts to build and promote economic ties to Latin America. Free trade agreements and special side agreements on environmental co-operation are driving countries such as Chile and Mexico to upgrade their environmental infrastructure at a rapid pace.

The work by the government and associated agencies has also created a highly favorable business climate for Canadian companies, who now have excellent opportunities to establish business connections.

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[20] Waste Management Markets, Richard K. Miller and Associates, 1997

[21] FIND/SVP study on the medical waste market as referenced in: Waste Management Markets, Richard K. Miler and Associates, 1997

[22] FIND/SVP study on the medical waste market as referenced in: Waste Management Markets, Richard K. Miller and Associates, 1997

The Department of Foreign Affairs and International Trade has made comprehensive information available on market opportunities and entry strategies on their web site, including information on market size and areas of opportunity, distribution channels, promotional venues and key contacts. This information is current and vital for any company doing business in this area.

Unless acting as a niche provider to specific projects, local presence is very important, with very high emphasis on local partnerships and joint ventures. For Canadian companies, time on the ground establishing relationships is critical, as much business is relationship-based.

Competition throughout Latin America comes from domestic suppliers (who also are partnership opportunities) and U.S. and European countries. The U.S. has close ties and an established presence in many countries, and European countries often have an advantage through exploiting opportunities for their countries to work on projects funded by the home governments.

Selected Country Discussions (Latin America)

Chile

Selected Areas of Opportunity[23]

- Processing and remediation of mine tailings for smaller and medium size older mines, especially solid waste containing arsenic.
- Assistance to pulp and paper industry in assessing, planning and designing pollution prevention and waste disposal processes.
- End-of-pipe solutions for older manufacturing companies who must meet new regulations.
- Alternative biomedical waste disposal technologies (due to stringent incinerator emission restrictions).

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[23] Sources: DFAIT/Team Canada market reports, DFAIT trade officials and U.S. Department of Commerce Reports

Overview

Chile is a key emerging market for environmental companies and is receiving a high degree of attention from federal trade officials. Agreements such as the Canada-Chile Agreement on Environmental Co-operation encourage Chile to move to Canadian environmental standards in many areas in the next few years. This is expected to result in many opportunities since:

- Chile will have to spend the funds to meet the more stringent standards
- Canadian companies are familiar with the standards and have the technology and expertise to deliver to meet these requirements.

Areas of Concern:

- Disposal of municipal solid waste
- Manufacturing/industrial waste
- Mining and smelting
- Forest products

These areas of concern, particularly in the resource sectors, play to Canadian experience.

Chile has the same characteristics as other Latin markets in terms of the preference for some local presence (unless acting as a niche sub-contractor). Additionally, interview respondents mention after-sales support and service as key to success.

Mexico

Selected Areas of Opportunity

- Biomedical waste disposal - incinerators, shredders, sterilizers and containers
- Industrial waste incineration
- Consulting and storage for hazardous waste management, especially chemical, petrochemical, pulp and paper and tanneries
- Consulting on waste minimization

Overview

- There is a major initiative happening now to build centralized solid and hazardous waste treatment plants on a regional basis. Two were under development in 1997, 3-5 more expected by 2000.

- As with Chile, free trade agreements (NAFTA) and side agreements on the environment obligate Mexico to increase spending on environmental enforcement, and position Canadian firms well for this business.

- There is a market shift toward complete solutions, especially in dealing with municipal waste, where the supplier needs to address all aspects of the problem and not just provide a specific product or service. Although this would appear to limit some companies, this is an area where alliances or partnerships would be a worthwhile strategy.

- BOT (Build, Operate and Transfer) projects are encouraged, to reduce the requirement for direct Mexican government spending.

Market Entry

- Successful companies will need to be able to understand the financing requirements and potentially bring this financing to the table as part of the sales process.

- There is heavy competition, especially from the Americans, who also benefit from NAFTA and have closer geographical and cultural links.

- As in other markets, local partners are important in understanding the culture and developing the necessary contacts.

Brazil

Selected Areas of Opportunity

- Metal finishing sludge disposal
- Waste management for paint
- Hazardous waste disposal (incineration)
- Soluble oil recovery
- Smelting sand recovery
- Paper and plastics recycling

Overview

- Financing is a key issue - project financing must often be put in place by the vendor. Creative financing such as BOT projects are becoming popular

- Market entry by foreign suppliers is best done with a local partner in some form of consortium

- Demand is rising for total solutions, including consulting, equipment and service, and financing

- ISO 14001 compliance is becoming a key issue for Brazilian companies, and suppliers of environmental services should be well-versed in these standards.

- Private sector buying is expected to grow over the next five years.

Market Entry

- Brazil is a growing market with very high potential. However, Canadian firms do not have quite the same advantage via NAFTA and other agreements as with Mexico and Chile.

- Most of the same general principles for doing business that apply to other South American countries apply for Brazil. Relationships and local partnerships are critical for success.

5.6.4 Eastern/Central Europe and the Soviet Union

Eastern Europe is beginning to address the vast industrial waste problems created over the past several decades. Many countries have initiated plans or put in to place regulation to address these issues. However, in most countries enforcement and compliance have been less than ideal.

From a Canadian perspective, there is a very large potential market, but the western Europeans are very well-entrenched as competition. Countries in this region also may be motivated by the desire for closer ties to the EU and chose to work with Western European firms.

For these reasons we have not reviewed Eastern Europe in detail, however, following are some points of interest.

Poland:

- Poland is the most advanced country in this region in terms of addressing environmental issues. A recent Team Canada report on Poland outlined solid and hazardous waste opportunities in the Mining sector:

- Technology for safe mining sludge disposal, and;

- Technology for control of acid mine damage;

- Doing business in Poland requires a long-term commitment. The Team Canada report also mentions that there are a lot of engineers and that the best opportunities lie in technology provision rather than services like consulting, unless in specific niches.

Russia

There are opportunities for Canadian firms in the Oil and Gas sector. As in other areas of Eastern Europe, enforcement of regulation is spotty. For this reason foreign firms operating in Russia may be attractive customers, as regulation tends to fall on them first as they can pay the cost to comply.

Opportunities may be found in products and services related to:

- Systems for recycling drilling mud
- Lined landfills for waste disposal
- Oil spill containment equipment
- Environmental impact studies

As in other regions, financing is a key issue and companies must be prepared to spend a very long time developing contacts and relationships.

6.0 CHALLENGES AND STRATEGIC IMPLICATIONS

This section reviews the major challenges the industry faces and outlines some of the strategic implications of these challenges. It then summarizes the views of interview subjects on both the roles and responsibilities of government and industry associations, and the key business success factors for waste management companies to realize the market opportunities described earlier.

6.1 Major Challenges the Industry Faces

1. Fragmented Nature of the Industry

- The industry is becoming more fragmented in terms of the types of companies and range of products and services provided. The industry is comprised of small technology manufacturers, large integrated service companies, engineering consulting firms and many other companies with environmental business components. Due to this fragmented nature, many companies believe they are not part of the same industry.

This can present challenges to government when setting policy or regulation, or in providing support services that can benefit the industry as a whole. It also presents a challenge to industry associations and other environmental organizations to represent all of the interests of their diverse membership.

2. Lack of Business Expertise and Experience

- In some cases, small manufacturers of proprietary technology lack fundamental business skills to operate a successful company. These manufacturers have the technical expertise, but may lack sufficient skills in other key areas such as management, marketing and finance.

This restricts the ability of companies to develop business outside of Canada, and to create and manage partnerships and alliances.

3. Lack of Sufficient Waste for Use as Raw Material

- In some market areas such as plastics, the volumes of secondary material supply from industrial sources are not sufficient to operate an economically viable recycling operation in Ontario. In many cases, companies are required to source supply from the U.S., resulting in high transportation costs.

This added high fixed cost of doing business in Ontario affects the bottom line profitability of waste management product and service suppliers.

4. Investment in Research and Development for New Technologies

- The success rate of introduction of new waste minimization and recycling technologies has generally been low. This has been due in part to the high investment required to commercialize new technologies and the availability of low cost disposal based options. In some cases, it is cheaper and easier from a logistical aspect to collect and dispose of material than to segregate it for separate collection and processing.

- Due to the above, there is little incentive for companies to invest capital in areas of new research and development. Rather, the limited capital that is available is invested in efforts to improve performance or increase cost-effectiveness of proven technologies.

The implication is that Canadian companies may start to lag behind other countries in terms of providing leading edge technology.

5. Financial and Borrowing Issues

Some respondents, mainly small and medium firms, felt that potential sources of finance generally view environmental and waste management technologies and businesses as relatively risky investments. This could be attributed to a variety of factors including:

- The potential environmental liability on the lending institution

- High probability of bad debt due to the generally low success rate for new environmental technologies and businesses

- Size of investment is small relative to the time and resources needed for due diligence

- Difficult for a lender to assess the business opportunity of a new or emerging environmental technology

- Reluctance to finance firms whose markets are heavily influenced by forces beyond the control of the firm's management, such as the regulatory environment.[24]

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[24] Source: Doyletech Corporation, 1992

The implication is that it is difficult for the small and medium start-up companies (those companies who are mainly developing niche technologies for specialized markets) to access capital to demonstrate and implement technologies in Ontario.

Some companies have been required to demonstrate their technologies in export markets before they can sell the technology in Ontario or other parts of Canada.

6.2 Changing Structure of the Industry

- There has been an industry-wide trend towards consolidation in all sectors. Examples include:
    - the acquisition of numerous solid waste operations by USA/Canadian Waste Services which is now the industry leader in Canada;
    - the merger of Laidlaw Environmental Services with Rollins Environmental Services to create the dominant player in the North American hazardous waste industry;
    - the acquisition of Laidlaw Medical Services and other smaller companies by Med-Tech Environmental in the biomedical waste management industry
- The major publicly traded solid non-hazardous waste service companies such as Canadian Waste Services are focusing on developing more efficient use of collection routes, processing centers and disposal facilities. They are reluctant to be dependent on commodity markets for waste materials. For example, reliance on commodity sales overexposed the larger companies as prices for recyclables collapsed in the latter half of 1995, which had a significant negative impact on earnings and stock prices (EBI Inc, 1996).
- There is a movement by Canadian Waste Services and BFI Waste Systems, the two largest national solid non-hazardous service providers, to a "back to basics" way of doing business focused on collection, hauling and waste disposal. They will likely only make major investments in recycling when it makes economic and business sense.

- Major companies involved in the industrial and hazardous waste management industry have also refocused their business activities. These include:
    - Laidlaw Inc.'s sale of its less profitable solid and biomedical waste operations in order to focus on the faster growing transportation sector.
    - Philip Services Corp's sale of its solid waste operations to concentrate on its industrial services and metal recycling businesses;
    - BFI Waste Systems restructuring of its entire North American Business Operations.
- There has been the emergence of smaller specialized companies who have developed product specific recycling businesses for niche markets. Some of the entrepreneurs who have established these companies have considerable and diverse waste management industry experience.
- There has also been an increase in one person "home based" consulting firms due to downsizing of government and consolidation of the waste management service companies. These enterprises have a cost advantage over traditional consulting based firms in the provision of certain services.

6.3 Roles of Key Stakeholders

The following section summarizes the responses from focus group and interview participants on the roles of government and industry associations.

1. Government - General

- Promote Ontario companies as environmental stewards and leaders in development of waste management technologies and services.
- Act as an information clearinghouse on industry progress and success stories to the general public, to ensure that the positive aspects of the industry are well known and understood.
- Provide a forum for generators to link with suppliers to discuss potential joint areas of opportunity (e.g., Internet bulletin board system).

- Encourage and facilitate alliances and partnerships that would allow for:
    - Creative alliances between suppliers to address waste management opportunities
    - Linkage and education of venture capital pools to business to enable financing of development, sales and expansion
    - Ontario companies to find partners/distributors in export markets for their products and services
- Implement procurement policies that favour environmental products such as Eco-Logo products to stimulate investment in new technology and market development.
- Ensure that the cost to build and operate new disposal facilities are based on state-of-the art environmental protection measures and future replacement capacity, as an economic incentive to encourage development and implementation of pollution prevention and 3R activities by waste generators.

2. Federal Government

- Establish waste management standards and criteria across Canada similar to the U.S. EPA for both solid and hazardous waste streams
- Work with provincial governments to facilitate the harmonization of regulations.
- More actively protect the interests of Canadian companies on issues concerning international waste management trade agreements such as the Basel Convention.
- Provide flexible but repayable loans to industry for research and development to stimulate development of new technologies and market applications for secondary materials.
- Identify and facilitate international opportunities for Canadian waste management companies.

3. Provincial Government

- Have full authority and responsibility for waste management to:
    - establish clear language regulations and legislation based on science and engineering principles
    - establish clear definitions of waste materials
    - enforce regulations to sustain and grow the investment made by private industry to develop the waste management infrastructure in Ontario
    - implement stiff penalties for companies not in regulatory compliance to ensure a level playing field
    - implement streamlined approvals procedures to allow private industry to develop and implement waste management components in a cost efficient and timely manner
    - ensure generators and suppliers are educated about existing and new regulations
- Create an environment which would allow private industry to develop and implement innovative and creative waste management solutions - for example, remove barriers to use reclaimed materials.
- Promote the environmental and waste management success stories of private industry.
- Facilitate action for private industry to respond when a need for a waste management solution is identified - bridge the gap between the opportunity and the solution by communicating the specific needs of waste generators to suppliers with potential solutions.
- Work with stakeholders such as Materials and Manufacturing Ontario to strengthen the relationships between industry and research institutions.

4. Municipal Government

- Implement and enforce disposal bans for materials where there are viable end-use markets available locally
- Facilitate competitive activity between the private and public sector on waste management bids - for example, ensure a level playing field by requiring proponents (private or public sector) to address all bid requirements such as financial assurances
- Establish a governing relationship with private industry - establish fair ground rules for conducting business in the community

5. Industry Associations

- Implement a model to "enforce" voluntary standards with respect to product stewardship and sound environmental business practices – establish membership criteria based on specific standards and codes of practice
- Provide input to government in the development of waste management regulations and policies
- Act as an information clearinghouse on waste management technologies and approaches and overall industry trends and issues
- Better represent the interests of all members especially the small and medium sized companies

There may be other stakeholders, who represent the interests of non-governmental organizations (such as environmental watchdogs), community organizations (e.g. ratepayer groups), employees (e.g. Canadian Council for Human Resources in the Environmental Industry, labour organizations) or other groups. These may be potential participants in any future process of stakeholder consultation.

6.4 Key Business Success Factors

During the focus group and interview process, study participants were asked what the keys to success in the waste management industry would be over the next 3-5 years. The following is a summary of their responses.

- Develop waste management products and services that enable industry to reduce capital expenditures or operating expenses while at the same time facilitate regulatory compliance.

- Provide integrated outsourcing services to generators that reduce the cost of environmental compliance and improve overall profitability.

- Develop and market a product or service that can be sold to companies, which have affiliates around the globe (e.g. multinationals). Fit into outsourcing trend and demonstrate success at one plant, which can be a model for implementation in other locations.

- Develop energy efficient products and services that can lead to process optimization to help a company minimize or eliminate waste generation.

- Develop a clear understanding of the market and waste management needs of industry as well as the solutions available to address those needs - implement the business mechanism to bring these two elements together.

- Develop and sell technologies and services that are commercially and economically viable and can demonstrate a bottom line improvement for a customer – cannot depend solely on the environmental benefit.

- Develop a reputation of being unique and innovative to gain a competitive advantage in the marketplace.

- In some industry segments, there is a mandatory need to be ISO 9000 certified in order to do business in certain geographic markets such as the U.S. – companies are using ISO certification as initial screening criteria for their supplier base.

Appendix A List of Contacts

1.	Mr. Kevin Brady	The Brady Group Inc.
2.	Mr. James Sbrolla	Canaccord Capital Corporation
3.	Mr. Jean-Pierre Dumont	Northern Telecom Limited
4.	Ms. Karen Broadhurst	Consultant to the Healthcare Industry
5.	Mr. Heng Lim	Hotz Environmental Services Inc.
6.	Mr. Rob Glass	Shred Tech
7.	Mr. Bill Gudgeon	Gudgeon Brothers Limited
8.	Mr. Gord Goddard	Recovery Technologies Inc.
9.	Mr. Bob Robottom	Norampac Inc.
10.	Mr. Paul Hansen	Chrysler Canada Ltd.
11.	Mr. Derek Yue	Industry Canada
12.	Ms. Doreen Conrad	Department of Foreign Affairs and International Trade
13.	Ms. Christine Wong	Department of Foreign Affairs and International Trade
14.	Mr. John Gartke	Department of Foreign Affairs and International Trade
15.	Mr. Francis Uy	Department of Foreign Affairs and International Trade
16.	Mr. Jim McCarthy	Electrical Equipment Manufacturers Association of Canada
17.	Mr. Gary Gallon	Canadian Institute for Business and the Environment
18.	Mr. Terry Stoops	Air and Waste Management Association
19.	Mr. Paul Hunt	Canadian International Development Agency
20.	Mr. Vivian Montewith	Canadian International Development Agency
21.	Ms. Marsha Permut	Department of Foreign Affairs and International Trade
22.	Mr. Andrew Harvey	Cyanide Destruct Systems Inc.
23.	Mr. Juri Kotler	MDS Nordion
24.	Mr. Alex Keen	Altech Technology Systems Inc.
25.	Ms. Susan Plewes	Ontario Hospital Association
26.	Mr. Tom Maxwell	Flourescent Lamp Recyclers Inc.
27.	Dr. Michael Day	National Reasearch Council
28.	Mr. David Cooney	National Reasearch Council
29.	Mr. David Morrision	Med-Tech Environmental Ltd.
30.	Mr. Walter Wells	Ecolube Recycling Inc.
31.	Mr. Jay Mileham	Canadian Consulate - Buffalo
32.	Mr. Vince Chiricosta	BOVAR Waste Management
33.	Mr. Monty Johnston	BOVAR Waste Management
34.	Mr. Paul MacFarland	GE Capital Technology Management Services
35.	Mr. Bruce Mitchell	Statistics Canada
36.	Mr. John Sanderson	Composite Manufacturing Corporation
37.	Ms. Eileen Smith	Waste Reduction Branch – Ontario MOE
38.	Mr. Roy Brown	Knowaste Canada, L.P.
39.	Mr. Blake Smith	Ford Motor Company of Canada Limited

40. Mr. Jim Horn	Resource Plastics Inc.
41. Mr. Wilf Goldlust	Canadian Waste Services Inc.
42. Mr. Paul Muldowney	Complete Waste Management Services Inc.
43. Mr. Bob Laughlin	ORTECH Corporation
44. Mr. Bill Balfour	Gartner Lee Limited
45. Ms. Catherine Dowling	Gartner-Lee Limited
46. Mr. Paul Pajunen	ECO-TECH Limited
47. Mr. Keith Carrigan	DURA Products International Inc.
48. Dr. Fred Edgecombe	Environment and Plastics Industry Council
49. Mr. Stuart Forbes	Canadian Centre for Pollution Prevention
50. Mr. Ian McGregor	Fielding Chemical Technologies Inc.
51. Mr. Peter McGeer	Materials and Manufacturing Ontario
52. Mr. Uwe Roper	Radian International Canada Inc.
53. Mr. Guy Crittendon	Hazardous Waste Materials Management Magazine
54. Mr. Peter Corbyn	Automotive Parts Manufacturers Association
55. Mr. Phillipe Dauphin	Canada Centre for Mineral and Energy Technology
56. Mr. Richard Laughton	Pollutech Environmental Limited
57. Mr. Garth Fowles	BFI Waste Systems Limited.
58. Mr. Steve Fletcher	Ontario Automotive Recyclers Association
59. Mr. Ian Shaw	Dofasco inc.
60. Mr. Len Shaw	Canadian Association of Recycling Industries
61. Mr.John McKay	Consultant
62. Mr. Ian Orchard	Environment Canada, Ontario Region
63. Mr. Brad Cumming	Environment Canada, Ontario Region
64. Mr. Ed Mallett	Ontario Centre for Environmental Technology Advancement
65. Mr. Robert Redhead	Robert J. Redhead Limited
66. Mr. Grant S. Trump	Canadian Council for Human Resources in the Environment Industry
67. Mr. Rodney Dobson	Consultant, Medical Waste Industry
68. Mr. Bruce Cook	Conor Pacific Environmental Technologies
69. Mr. John Nagata	Canadian Association of Metal Finishers
70. Mr. Brian Smith	Canada Centre for Mineral and Energy Technology
71. Mr. Wayne McQuinn	Association of Consulting Engineers of Canada

Appendix B: List of Focus Group Participants

Generators

Organization	Attendee
Kuntz Electro-Plating Inc	Mr. Mike Flood
Kuntz Electro-Plating Inc	Mr. Robin Leach
General Electric Limited	Mr. Abdul Deffie
General Motors of Canada Limited	Mr. Bruce Reid
Ministry of The Environment	Ms. Linda Matthews
The Hospital for Sick Children	Ms. Valerie O'Grady
Northern Telecom Limited	Mr. Jean-Pierre Dumont
Canadian Association of Metal Finishers	Mr. John Nagata
Torcad	Mr. Andrew McDonald

Suppliers

Organization	**Attendee**
Cyanide Destruct Systems Inc.	Mr. Andrew Harvey
Philip Services Corporation	Mr. Chad Ferrara
Laidlaw Environmental Services Limited	Mr. Bob Slivar
Thermo-Tech Technologies Inc.	Mr. Ed Kroeker
Med-Tech Environmental Ltd.	Mr. Dave Morrison
Ontario Hydro Technologies	Dr. Michael Sills
The Brady Group	Mr. Kevin Brady
Philip Services Corp	Mr. Frank Zechner
Plas-Sep Limited	Mr. Jim Brown
Plas-Sep Limited	Ms. Bev Brown
Philip Services Corp	Mr. Karim Tasso
BFI Waste Systems Inc.	Mr. David Walsh
Green Court	Mr. Marsun Lipsit
Green Court	David Dunn

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Appendix D: OCETA Survey Methodology

Statistical Analysis - Background

The numbers quoted were generated by OCETA. The bulk of the information came from the OCETA Ontario Environmental Industry 1997 Economic Survey. We took the following steps:

- ¤ Separated out all the companies whose primary industry was Waste Management products or services
- ¤ Used the OCETA assumptions as to size of the total environmental industry (1564), and hence the proportion of that which was waste management (21%) to get an estimate of the total numbers of Waste Management Companies operating in Ontario of 332.
- ¤ Evaluated the mix of the data. It was determined that the large and small firms were underrepresented, so we selected 17 additional companies who had not responded to the original survey, or had only showed information for one location rather than for all Ontario operations.
- ¤ Sent each company a modified survey. All companies were called at least twice to encourage compliance. Seven companies responded.
- ¤ Deleted the information from the original entry for the company who had provided new information for the entire province
- ¤ Generated analysis for the industry.
- ¤ Re-generated the analysis based on company size to get a better representation or weighting

Assumptions Made In the Analysis

There were three underlying assumptions made during the analysis:

1. The OCETA survey results for the Ontario Environmental Industry were representative of the industry
2. The industry had not overall changed significantly between June of last year and the current year
3. The acquisitions and sell-offs in the industry netted no overall change in the revenues and job creation in the industry. Thus, by sampling prior to the activity, and then requesting information only of companies not included in the prior survey, and those who did not make

significant acquisitions during this period, we did not overestimate the marketplace as a whole

In addition, we received incomplete data from one of the larger entities in the industry. We made some 'best guesses' based on our knowledge of the industry in order to be able to include the results. Omission of results or the inclusion of incomplete results resulted in significant overall variances due to the impact of the firm on the market. We used their published figures in their annual report for Canada for 1995 - 1997, and estimated that the Ontario portion represented 40% of the total Canadian revenues. We then conservatively estimated their revenues for 2000 by multiplying their 1997 revenues by the amount of earnings declared for the first quarter of this year. This is a very conservative estimate of growth, and may result in an underestimation of the market, but we felt it better to error on the side of caution. We also held their employment figures constant between 1997 and 2000.

We believe that the proportion of small, medium, and large firms initially responding to the survey was proportional to the overall industry. The original survey showed ratios of 48%, 41%, and 11% (Small, Medium, Large) for all firms. For this study, Small meant <=5, Medium meant more than 5 and less than 51, and Large meant 51 and over. When the Waste Industry was studied separately, the ratio found was 41%, 50%, and 9% respectively. This is consistent with the current situation where there are a few large firms who dominate the industry. This Waste Industry-specific ratio was used to project sales, employment, and overall total wages for the industry. Projections were done by taking the ratio of each time of firm times the total number of companies projected for the industry times the average for the firm type. The three values were then added together to get the associated industry value.

TCI Convergence Limited

Interview Guide: Waste Management Product and Service Providers

Part One: Introduction and Background

Purpose of the study:

This study is being conducted on behalf of the Green Industry Office of the Ontario government and, in turn, the providers of solid and hazardous waste management products and services. The purpose of the study is to assess the current state of the industry and identify areas of opportunity. We would like your help to identify current and emerging opportunities and how government and other stakeholders can help you and others in the industry to better take advantage of opportunities.

Purpose of this interview:

The purpose of this interview is to benefit from your insight on the following topics:

- The state of the solid and hazardous waste management industry in Ontario.
- The size and growth of this industry.
- Trends and issues effecting change in the waste management industry.
- Problematic waste streams and the options currently available for treatment of these waste streams, including technology.
- Other "customer requirements" of the industry .
- International markets for waste management products and services.
- The roles associations, industry, government and vendors currently play in dealing with industry issues.
- The roles these stakeholders or partnerships between them should play in the future.
- Other areas of concern or opportunity.

All responses you provide will be kept confidential and will only be shared in aggregate with other responses.

Part Two: Discussion of the Current State of the Industry and Growth

1. *What products and services do you provide? (List)*

Products	*Services*

2. *What have been the major issues and trends in your area(s) of business over the past 2-3 years?*

3. *How have these affected your firm?*

How have these affected your customers?

In what markets are you active?

	Yes	No	Region(s)
• Ontario	___	___	___
• Canada	___	___	___
• North America	___	___	___
• International	___	___	___

5. *What would you estimate as the total 1997 market ($CAN) for your products and services?*

Product or Service	Total Market	% Ontario	%Rest of Canada	%U.S.	%International

6. *Is market demand for the products or services in this area(s) growing?*

Product or Service	Growth rate (96-97)	Growth rate (97-2000)

7. *Is employment growing in your firm?*

- If yes - What do you expect the growth to be over the next 3-5 years? (%)

Part Three: Waste Streams

8. *How are the waste streams in your area(s) of business changing?*
   examples: *Streams growing or being reduced*
   Streams changing in composition
   Streams with new generation source

9. *For those waste streams you identified as being reduced how are they being reduced?*
   (example: changes in production processes)

10. *What effect will any changes in waste streams have on your companies products and services?*

11. *What new opportunities will be created by changes in waste streams?*

12. *Are new technologies or processes emerging to deal with the waste streams in your area(s) of business?*
    Details:

13. *What opportunities for your products and services are emerging in foreign markets?*

14. *Are you aware of waste streams for which there is no satisfactory prevention or management?*

Part Four: Competition and Constraints

15. *Who are your competitors?*

- Domestically

- Internationally

16. *Are new or changing waste streams creating new competitors?*

- If Yes
- Which streams are creating which competitors?

17. *Are you aware of any waste management options not currently available in Canada which could pose a competitive threat?*

- Yes

- What is the option?

- Where is it being used?

Specific vendors?

18. *What, if anything, do you see as constraining you from competing effectively ? Examples: regulation, financing, lack of access to R&D*

Domestically?

Internationally?

Part Five: Market Awareness

19. How do you become aware of new opportunities or new waste management products and services in Canada.

- From customers?
- From associations?
- From government?
- From trade shows?
- Other

20. How do you become aware of the requirements for waste management products and services in other countries?

- From customers?
- From associations?
- From government?
- From trade shows?
- Other

21. What more could be done to make you aware of these opportunities?

Part Six: Future Trends and Issues

22. What the major trends or issues you see affecting this industry in the future?

- Regulation
- R&D, Technology
- Economic
- Competitive
- Process design changes

23. What changes may occur as a result of these trends or issues?

- Consolidation
- Niches
- Globalization
- U.S. influence

Part Seven: Roles

24. *What role should the government play in this industry?*
Example: Market identification, financing, re-regulation

- Federal
- Provincial
- Municipal

25. *What role should associations play?*

26. *What opportunities do you see for partnerships between the stakeholders?*

Conclusion

27. *What will be the key to being profitable in the waste management business in the next 3-5 years?*

28. *Any other comments?*

29. *Demographic Information*

- Name
- Position
- Size of Company
- Revenues
- Employees
- Growth (Sales Past 3 years)
- Projected (Sales Next 3 years)
- Location (head office)
- Locations (major branch offices)

30. *Thank and end interview*

READER RESPONSE FORM

ECONOMIC AND MARKET ASSESSMENT
ONTARIO WASTE MANAGEMENT INDUSTRY

NOVEMBER 1998

We value your comments. By completing this form you will help us to increase our understanding of how we can best utilize valuable resources and reduce costs.

1. Did you find the Economic and Market Assessment of value to your business or operation?

2. What part of the report did you find most useful?

3. Are there industry issues and opportunities not identified in the report? If so please identify.

4. Are there areas in the report we can improve?

5. Any other comments you wish to share?

Respondent's name/organization/address/phone number:

Please return a copy of this Form by FAX or by mail to the following address:

Ontario Ministry of the Environment
Green Industry Office
40 St. Clair Avenue W.
12th Floor
Toronto, Ontario
M4V 1M2
TEL: (416) 314-7898
FAX: (416) 314-7919
ATTN: Nora Gurland

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For additional copies of this report, or information on Ontario's environment industry sector, contact:

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ONTARIO'S GREEN INDUSTRY